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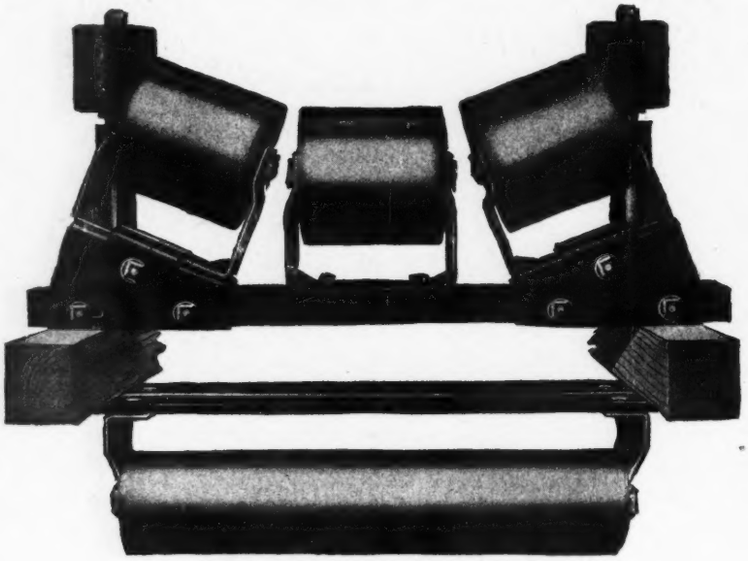

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# Engineering and Mining Journal

*A Weekly Journal of the Mining and Mineral Industries*

METALS NON-METALS PETROLEUM

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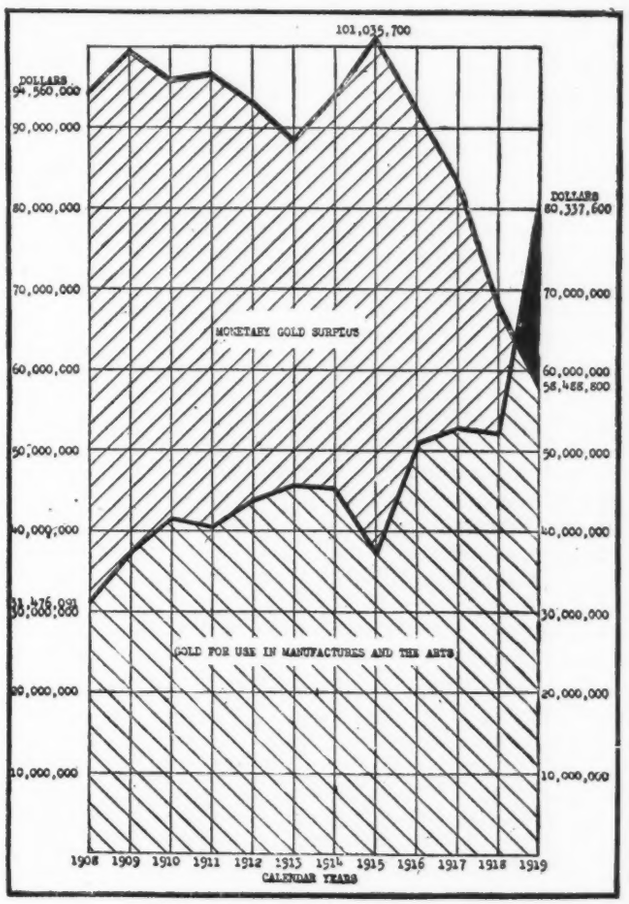
*Volume* 109 New York, March 6, 1920 *Number* 10


## What Would Happen?

SUPPOSE the gold miners of the United States should cease presenting their gold to the United States mint for sale at $20.67. Suppose they should hold it, say for $25 an ounce, for sale at that price to anyone who would pay it. What would happen?

Gold is a commodity, and there is apparently no obligation, moral or otherwise, to prevent producers from selling it in the highest market. When, as in pre-war days, there was only one price, it was natural and convenient to take it to the mint, and for the mint to act as distributor to the gold-consuming industries, among which the jewelry industry is chief. But now gold has various prices in foreign countries, as expressed in its buying power in other commodities. South African and Australian gold is at a premium of around 60 per cent, in English currency, over pre-war prices; even Canadian gold, sold in the United States, brings 16 or 17 per cent premium, on account of the low rate of Canadian exchange, bringing the price received for gold in Canadian currency to around $24. Therefore, the gold industries of other countries are flourishing; it is only in the United States that gold is still at par, as expressed in currency.




By permission of the American Mining Congress.

GOLD PRODUCTION OF THE UNITED STATES AND GOLD CONSUMED IN MANUFACTURES AND THE ARTS. CALENDAR YEARS 1908-19

At present more gold is used in the United States for industrial purposes than is produced. This gold is purchased from the mint. Therefore, the United States production does not increase our gold reserve, or strengthen the value of our paper dollar. Why should not the miner sell direct to the jeweler, and hold for the higher price which his commodity is intrinsically worth?

Could he get a higher price? Certainly, the jewelers would pay it, if they wanted the gold. They would pass on the price to the customers and sell more jewelry than before, for their experience is that people want costly things. They would want the newly produced United States gold, unless in the competitive market thereby inaugurated they could buy cheaper gold. It is, however, conceivable, and even probable, that the United States Government might keep the market at par by supplying the jewelers from the United States gold reserves with gold at $20.67, in order that the disparity between gold and currency should not become a matter of price quotation. Looking on gold in the light of a commodity, it would appear unfair of the Government so to do; but looking at it as the symbol and basis of currency stability, the Government might well consider the stabilizing of its currency of more urgency than the rights of the miner. Therefore, this plan could probably only succeed with the connivance of the Government, which brings us around to the plan suggested by Mr. Lindgren as reported in our issue of Jan. 24.

## Philip N. Moore and War-Minerals Relief

READERS of our news pages will note in recent issues accounts of the sharp attacks made by the attorneys for the Chestatee Pyrite and Chemical Co. upon the War-Minerals Relief Commission, upon the auditor, C. B. Holmes, and especially upon one of the commissioners, Philip N. Moore.

They did well to single out these two men for special attack, for they have been especially firm against the bulldozing tactics of this company, and have had a disconcerting tendency to revert to facts and stick to them. Mr. Moore, as the engineer member of the commission, has been the only one who could size up the statements of claimants and weigh the evidence of the auditors and engineers of the Bureau of Mines accurately. Thus he has been a rock against which lawyers and witnesses for the claimants, and the claimants themselves in the Chestatee case, have battered. Engineering and auditing facts annoy these gentlemen; and they fall back on the denunciatory eloquence of the lawyer,

which they are wont to find so powerful in winning nondescript juries to their way of wishing.

Indeed, indignant noise of this sort impresses the uninitiated. "The committee apparently hopes," writes our correspondent, "to influence the commission so that more attention will be given to common sense deductions rather than those based on ratios to built mills, to planned mills, and similar classes of deductions." Again, it is hoped that the moral obligations of the Government "can be settled equitably on broad practical grounds without going so deep into technical possibilities." Doubtless this reflects the effort by the Chestatee company's orators to influence the Congressional committee. The commissioners, according to them, should not inquire into sordid details, but look at it in the rosy glow of sentiment, and hand over a cool million to be divided up among promoters, money lenders, and attorneys.

From our knowledge of Mr. Moore's methods and aims, we wish to back him morally "to the limit." Desirous that those to whom reparation is due under the act should receive it in full, the training of the mining engineer enables him to see through the many varieties of buncombe with which some of the claims among the hundreds submitted are loaded, and to stand between such claimants and the Treasury. It is another illustration of the value of the engineer in public affairs. With a new engineer member of the commission, Mr. Pomeroy, we hope Mr. Moore's hand will be strengthened and upheld, as well as the disinterested and careful findings of the engineers and auditors of the Bureau of Mines which the Chestatee attorneys seek to discredit.

## Admiral Peary's Life Work An Inspiration to Engineers

ON APRIL 2, 1909, the American flag was planted upon a hummock of ice at latitude 90 north. Beneath the ice crust 1,500 fathoms below was the bottom of the Arctic Ocean.

The North Pole has been the dream of many an adventurous man. Its discovery has been the object of a number of expeditions. Love of adventure lured explorers into the bleak stretches of the Arctic in the vain hope of solving this mystery. It was not for gold that they went, although gold was in a measure generously subscribed for the financing of different expeditions, and without it and the enthusiasm of those who could not go, but who could lend their support, that flag would perhaps not have been planted there.

Admiral Peary is dead, but he won a place in American history and in the world's history that will live for many a century. Two elements in Admiral Peary's character are worthy of close study by engineers. One is an indomitable purpose which finally succeeded in nailing the stars and stripes to the North Pole. The great majority of people are satisfied to accomplish what is immediately before them, or, if they have some definite objective, succumb to the drift of circumstances. There are few who have that unwavering persistence which keeps them headed toward their objective in spite of all obstacles. It is men of this fortunate kind who cause the world to progress. Without definite purpose, without persistence, Western America would not have been developed, nor would Chuquicamata have contributed to the copper markets of the world, nor American mining industry won its leadership over other countries.

The other element cannot be so simply characterized. It can, however, be included in the word fore-planning. Peary learned from the failure of others the weak points in their plans. He experimented with Arctic conditions until he had thorough acquaintance with all of the minor and major elements of his problem. He did precisely what every intelligent engineer does. He made no conclusions until he had thoroughly ascertained the facts. He had no illusions about the difficulty of his problem. He was not hasty. His final effort was an admirable culmination of a clean-cut, well-thought plan. Herein is the great lesson in Admiral Peary's life work for engineers, whether they be mining metallurgical, or engineers in other lines.

## Mining in the Magazines and Movies

IN READING magazine stories woven about the particular industry in which we are engaged we usually expect to find something incongruous—something which shows the author to be unfamiliar with the life which he attempts to describe. Yet we are always particularly interested in such tales, partly for this very reason, perhaps; we wonder what ridiculous break will be made.

Mining, having a comparatively large romantic appeal to most people, is taken as the foundation of many stories by authors whose ability at narrative writing is considerably greater than their knowledge of what goes on in mining districts. By placing the scene in Arizona or Alaska or Canada, they believe that few readers will have the knowledge to notice their technical meanderings. Nor will they, for that matter.

Stories of the kind mentioned are common in the literature which we can buy at 5c. and even up to 25c. a copy at the corner newsstand. The exception is worth noting, so we commend to our readers a perusal of "Dick Tresco and the Yellow Streak," in the March *American* magazine. The author is Lewis Parsons, associate editor of our San Francisco contemporary. Mr. Parsons' personal knowledge of what a bush fire in the Porcupine district of Northern Ontario means enables him to use material which would not be available to ordinary fiction writers.

We would also strongly urge the wisdom of the employment of a mining engineer in a consulting capacity by our California moving-picture producers. Almost every trade and profession is required in the production of the modern movie, but the services of any one conversant with mining are evidently not considered necessary. Doubtless several of our readers are anxious of an opportunity to enjoy the well-known climate of Los Angeles and vicinity. This is a chance for employment which we believe has been overlooked.

## Increasing the Use of Mechanical Devices Underground

THE mining industry faces, together with other fields of endeavor, a shortage of unskilled labor. Such a statement, in light of certain unsettled condition of affairs in the labor world, may perhaps be misconstrued, but it is not made with the intention of reflecting in any manner on the unrest existing today. Rather, the conclusion comes from a consideration of the various factors that relate to the procuring of labor, the attitude of the workman to his tasks, and, to no slight degree, the determination of the value of certain work as compared with the costs of other stages in the same general operation.

It is altogether probable that the final regulations which will govern immigration to the United States, when put into effect will undoubtedly be more stringent than those in the past. Americanization will be a big consideration, and a higher standard of eligibility will be sought before new entrants are admitted to the country. Heretofore, industry has found a place for immigrant labor, and not unwillingly, for there has been, and will continue to be, certain work that requires a lesser degree of intelligence than is demanded by the skilled trades.

The mining industry has drawn heavily upon immigrant labor, partly due to the fact that companies have been glad to secure such workmen and also because many of them were previously engaged in similar occupations in their own country. Of this latter class it may be said that the industry has been the gainer. Overcoming the difficulties of the language, many of these men have demonstrated excellent ability and have proved to be of such proficiency that they now occupy positions of trust at mines, mills and smelters.

Allowing a probable decrease in this class of labor from the source of immigration, the possible supply of unskilled workmen is dependent upon those now so engaged and a smaller portion who may be gleaned from an ever-shifting, and more or less shiftless, tribe, who wander from camp to camp, and a more dependable element who seek experience and prefer a certain period of apprenticeship in order to fit themselves for bigger things. As the education of the laborer proceeds, his newly attained knowledge demands expression, his attitude toward his "job" changes, and he soon tires of the daily routine of mucking, swamping, or the like, so that it is necessary to supply him with work of more responsibility.

The establishment of wage rates for certain classes of work in mining is determined, as in other industries, by their relative importance as to the degree of skill demanded from those performing the operation. Each step in the process bears a fixed ratio to the others, this ratio having been determined by a careful study of the results obtained and general conditions surrounding each task. It is obvious that a change in the wage paid for one should bring a corresponding change in the others. Therefore, it is illogical to suppose that if radical increases were made in the heretofore lower-paid occupations, for the purposes of stimulating a satisfaction with their task among those workers, there would be no protests from the others.

A possible solution of the difficulty is suggested by the recent advances made in machinery adapted for underground use. Compressed-air drilling machines were the natural result of a demand for increased efficiency in an already skilled department of underground operations. Electric haulage has superseded the old hand-tramming methods and the use of mules to a large degree, and, in fact, there are many instances where modern methods underground have replaced those which were deemed adequate in the earlier days of mining.

There will probably never be a period when the time-worn and time-honored shovel and wheelbarrow will be placed in the discard. But the use of both of these implements has decreased and will continue to decrease. A few years ago it was successfully demonstrated that a small drum, operated by compressed air, could be mounted on a stull or post, and, by means of a short cable, the other end being fastened to a slusher, more dirt could be pulled into a chute at a greater rate of speed than that accomplished by means of a wheelbarrow. This same machine is used in the hoisting or lowering of timber from one level to another, and, though there is no saving in the number of men employed in the operation, the work may be done in a safer manner and with more dispatch. There are on the market today several types of so-called mucking or shoveling machines. Their scope of usefulness in undergound operations has been enlarged, and many of the features which were a drawback to a general use of the earlier types have been overcome.

The history of machine drilling shows that no one type was suitable for all conditions of ground, and, though the same may not be true of shoveling machines, there is reason to believe that the variation of underground conditions with respect to the method of mining will demand considerable differentiation in the type of loading machines that meet popular requirements and acceptance. The utilization of a heavy, large-capacity loader is successful in a main drift where sufficient headroom is supplied, but this machine is almost useless in a caving stope, where there is small headroom and it is necessary to move the loader rapidly from one place to another on the same level or on different levels. In the smaller types, more attention has been paid to the portability of the machine. Regardless of the type adopted, the use of the underground loading machine offers an opportunity for the saving of expense in a department of underground work which is probably affected soonest by any shortage of labor.

Hand tramming at best is expensive, even if the labor so engaged may be regarded as unskilled. It may be said that trammers, as a class, are not so much in evidence as in the early days of mining, but there are still the short distances to the main haulageways and chutes on the sublevels that must be negotiated, and this work may fall to the lot of the miner or a trammer; but the long hauls by man-power are almost a thing of the past, and even the mule is less in evidence. Electric haulage systems have been installed in mines where feasible, and the expense has proved to be justified. In most cases the system has consisted of main haulageways, together with whatever branch lines have been regarded as necessary. The motor, dragging a string of loaded cars, pulls in at the shaft station where some arrangement is provided whereby ore may be emptied into a shaft pocket and from there drawn off into the skips. The practices of dumping the cars directly by hand or tripping a lever still prevail in many mines, although several have adopted a rotary dumping arrangement which completely overturns the cars, emptying their contents into the bins.

It is not the intention to criticise methods now in operation, for, although there are many mines that show poor management in keeping to ancient methods, it is realized that in certain instances the life of the mine or other circumstance does not justify changes. But it is most important that the mining industry should take cognizance of the fact that development must take place in all branches of the work—surface and underground—and that full efficiency about the mine cannot be obtained until the same ingeniousness and application is placed upon the underground problems as those dealing strictly with surface mechanical equipment. Human labor presents limitations, but there are no bounds to the capacities of mechanical devices.

## Federal Control Of Explosives

IN H. R. DOCUMENT No. 284 there is an attempt to reopen the question of Federal control of explosives, which apparently had died when Senate bill No. 2896, introduced by Senator Nelson, was allowed to remain in committee. In the document first referred to Secretary Lane said:

My dear Mr. Gillett:

In view of the present conditions of economic unrest, it is my belief that the explosives regulation act of Oct. 6, 1917, should be amended in accordance with the tentative draft of a proposed amendment submitted to you with my letter of June 20, 1919, a copy of which is herewith inclosed, and that as so amended said act should be continued in operation for the balance of this fiscal year.

It is estimated that an appropriation of $160,000 would be required for carrying into full force and effect the provisions of the said act. In this connection I beg to advise that on July 19, 1919, balances of the explosives regulation appropriations aggregating $118,355.25 were turned back into the Treasury of the United States.

Cordially yours,
FRANKLIN K. LANE,
Secretary.

This communication of Secretary Lane, together with the tentative draft of the bill referred to, is a move on the part of the Administration to secure widespread control over the use of explosives. It will be remembered that the act of Oct. 6, 1917, was enacted as a war measure, and, although it was conceded at the time that there would be much inconvenience and annoyance to users of mining explosives, practically everyone loyally accepted the regulations and effectively co-operated in their enforcement. Acceptance of Federal control was probably made easier by the fact that there was an understanding that such control would cease with the termination of the war.

Under date of Oct. 11, 1919, p. 603, we commented editorially on the Nelson bill. We took the position that that bill was an example of too much regulation and that it is to the interest of the mining industry of the separate states to secure legislation through their respective state legislatures.

We are in accord with the general principle that the sale and handling of explosives should be so regulated that neither criminals nor anarchists could obtain them. We do not feel that Federal control as outlined in the suggested bill of Secretary Lane will create anything more than a nominal obstacle to individuals who contemplate a wrong use of explosives.

Close control of the distribution of explosives rests first in the hands of the manufacturers of explosives, and second in the police powers of a state. We know of at least one large manufacturer of explosives who requires a signed order for the purchase of explosives, in which the purchaser must be vouched for by two witnesses known to the manufacturer. The order for purchase must state definitely the amount, purpose, and place of use, and the witnesses are required to state that the applicant is personally known to them and that to the best of their knowledge and belief the explosives are to be used at the place and for the purpose stated.

The manufacture of explosives is now concentrated in the hands of relatively few companies. Probably most of them have a somewhat similar system to that just described in operation. At least such companies can be closely controlled and it would be to their interest to oversee the distribution of explosives carefully.

The licensing system could not accomplish much more. When it is realized that individuals can purchase rifle and shot-gun ammunition without restriction, the proposed control of mining explosive will merely have the result of closing one door while another is left wide open.

This legislation is opposed by mining companies and by manufacturers of explosives as irksome and restrictive. At the same time the argument is made that the proposed number of inspectors and the appropriation suggested for the administration of the act are inadequate. We are inclined to agree with this point of view after carefully considering the question in all of its aspects. Coming at a time when Governmental economy should be the order of the day, legislation of this kind might well be tabled.

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## Frenzied Finance in the Post Office Department

THE extent of the international money-order business done in many mining camps where a large proportion of foreigners is employed is often startling. Considerable criticism has been made of foreign labor on the ground that much of what the workers earn is sent out of the country. However, they have little chance as long as Mr. Burleson is in charge of the Post Office Department. He has found a way of turning their trust of Uncle Sam to practical account for the rest of us, so that postage can be reduced and the department can show a profit.

An Italian lira is now worth, in this country, about 5½c., and a dollar will therefore buy about 18 lire. Yet a postoffice money order for which we pay a dollar is worth only 5.15 lire. Moreover, for the trouble this causes the department, the usual fee of 10c. is also charged, no doubt to add an air of regularity to the transaction. If it were possible to buy a money order for payment in Austria, which it is not, we shudder to think how the Austrian who wishes to send a present home would be scalped, for the crown is worth only 0.4c., compared with a normal value of 20c.

An inspection of the foreign-exchange table in our morning paper showed that the only country with which exchange is markedly against the United States is India. The rupee, normally worth 32c., is now worth 46c., due, possibly, to the fact that so many of us are now obliged to drink tea. Now, Mr. Burleson must be consistent, we thought, and visions arose in our only fairly well-paid editorial mind, of the lucrative business which could be done by buying money orders good for rupees at the old normal rate of exchange, and then selling them to those who seemed willing to pay a premium of about 44 per cent.

Inquiry at the post office however develops the fact that money orders are not written on India for rupees, but for the British pound, at the rate of £1 for $4.87, or considerably above the current rate. Thus were our dreams shattered, for the Post Office Department's policy seems to be "heads I win; tails you lose"—anyway you look at it.

Of course, daily changes of the foreign money conversion table could hardly be expected, but frequent changes to keep pace approximately with the foreign exchange situation could easily be made. In fact, it is done in Canada, where the charge for a money order payable in the United States is commensurate with the value of the American dollar in that country.

# WHAT OTHERS THINK

## Unimetallists, Bimetallists, and Sinemetallists

Under the above heading in *Engineering and Mining Journal* of Jan. 31, Theo. F. Van Wagenen discusses the problem of currency. Being very much impressed by the soundness of his logic (quite possibly because it strengthens my own convictions), I recommended it to a hard-headed associate, who dismissed the matter by stating that Mr. Van Wagenen's letter should be headed "Unimetallists, Bimetallists, and Sentimentalists." This attitude is the first barrier to the team of high-spirited equities which Mr. Van Wagenen holds so nicely in check. Nevertheless, this barrier is the instinctive recognition by the practical man of the vital economic equilibrium in which we all live and move and have our being.

In spite of this concession to conservatism, to which I make a sincerely respectful bow, I should like to put forward a few further considerations in support of the suggestions made.

The three conventional essentials of an acceptable currency are as follows. It should be:

(a) A convenient medium of exchange.

(b) A sound standard of value.

(c) A safe basis for deferred payments.

There is a further qualification, not mentioned because it is so obvious, and not observed because it is not mentioned, particularly in Latin-American republics and in Soviet Russia:

It should also be:

(d) Something less than the total capital wealth measured in terms of annual production.

(a) *As a convenient medium of exchange* the virtue of bullion lies in the fact that owing to international distrust it is demanded. It has, however, no more intrinsic virtue than had the cowrie shell, which was promptly repudiated when the first enterprising savage uncovered the first private hoard and rashly talked about it. The conceivable advent of synthetic gold and silver might well make both these metals playthings for our children, together with the cowrie shell. The conservative, if he ever lies awake at night, should realize that what cannot be accomplished economically may be done over-night by the sentimental scientist or as an unintelligent protest against pressure. The most chastening education for the conservative would be a short course in geology and a walking trip over a few miles of upturned sedimentaries, which represented centuries of law and order.

(b) *As a sound standard of value,* the virtue of gold and silver has been badly shaken. If there is any doubt about this it is only necessary to scrutinize the quantity or quality or duration of any service which can at the moment be commanded by a quarter of an ounce of gold. This function however, still works approximately within the limits of dawn and sunset.

(c) *As a safe basis for deferred payment* the best information may be obtained from any pensioner or recipient of an annuity measured in dollars.

(d) *As an approximation of the total capital wealth measured in terms of annual production,* we are so well within safe margins in this country that we have taken little trouble to ascertain where we stand. Our present issue of paper dollars amounts to about four and three-quarter billion and is backed by a metallic reserve of one and three-quarter billion. Our national notes-of-hand, which are currency of larger denominations in the shape of Government bonds, is about twenty-six billion. Our annual budget is about five billion. This presumes a heavy tax-paying ability for overhead alone; and, lacking facts, on the assumption that taxes absorb not more than 50 per cent of our surplus, implies a minimum capital wealth of 5 x 20, or 100 billion. If to this tax-paying ability is added the cost of luxuries such as municipal government, and necessities such as tobacco, our capitalized earning power is probably far in excess of 100 billion, and this surplus would easily take care of our over-issue of bullion vouchers which is estimated as above at about three billion. However, disregarding this factor, if we add to our floating notes-of-hand (which are very well endorsed) this over-issue, we get a total issue of about twenty-nine and a quarter billion.

If we reduce these astronomic figures to simpler terms, we are in the position of a farmer who has a mortgage of $29,500 on a $100,000 farm, but who hesitates to purchase necessary machinery or employ additional labor because he has only $1,750 in gold buried under the hearth which he has to hold against a one-day note for $4,750 with the local First National Bank, which institution is not legally authorized to advance money against land.

Metallic currency, then—or currency issued against actual bullion—is not a measure of value. It is primarily a measure of distrust and belongs to the region of psychological research. The only qualification it satisfies is that it is a convenient medium of exchange because of the cost of substitution and other physical properties. The cost of substitution, or scarcity, may not always apply, and does not apply at the moment with any safety to silver. If the Orient should become as sick of it as the whale was of Jonah, silver would speedily become one of our humblest byproducts. Both gold and silver have the fundamental weakness of being subject to private production, and this is the identical weakness which demonetized the cowrie shell.

If we could agree upon a constitutional amendment to guard against lack of scruple and lack of caution, I would suggest that properly imprinted asbestos disks would be a perfectly satisfactory medium of exchange if these disks represented pledges of real value.

What is advisable is a detached view of the whole situation, taking as a chastening factor the vital condition that the present equilibrium is the very medium of our whole social and economic culture. If our currency is to bear a just relation to our real wealth and to be a true measure of value, we must first ascertain what constitute our tangible values. These without question are land, labor, and time, the limiting factors of production. From an engineer's standpoint, the surplus yield over current essential expenses is the measure of surplus value per annum. If this is represented by X,

then 20X approximates our total capital wealth on the modest basis of 5 per cent earnings.

As intimated by Mr. Van Wagenen, there should be a vital relationship between our total productive wealth and our currency on one hand, and our total productive wealth and our taxation on the other hand. This might be simply approximated by a currency issue based on the two factors of acreage and population and a system of taxation based upon the same two factors, time being a constant in both cases.

For such a purpose the United States would have to be divided into districts within which the two factors of area and population would be determined. Securities in convenient units resting upon a Federal first lien on all land-holdings would then be issued to the owners, who, after the first flush of opulence, would be rapidly sobered by the fact that their Federal taxes would be in a just ratio to their new negotiable wealth, and as chief taxpayers they are then faced with the responsibility of providing not only all Federal revenue, but also of providing a sinking fund for the retirement of the unsecured currency outstanding. A working capital would be provided in this way very similar to the proceeds of a railroad bond issue, and the country would probably enter a golden era of development.

What would be the effect of this newly released mobile wealth? Reverting to the picture of the gloomy farmer, it would mean that he would suddenly feel as rich as his children do normally when he dies and the estate is liquidated. The presumption is, however, that he would turn this liquid capital into something more productive than automobiles and silk stockings. In case of a dissipation of this capital and failure to meet his taxes, the land would revert to the state and be sold at auction to would-be operators. The original owner has already been provisionally compensated, and the new owner would pay into the treasury whatever sum was compelled by the competitive bidding of the best qualified board of appraisers that science could evolve—namely the neighbors. The Government would then assume any deficit till it could be absorbed by the margin of taxes provided for the sinking fund. Any surplus in justice would be handed as a booby prize to the late unsuccessful operator.

The reproaches leveled at such equitable proposals as these will contain references to the assignats of France and to the single-taxers at home. This cannot be avoided; the assignats were overdone and the single-taxers are underdone. The weakest point in the man-acre-year is that labor does not bear a constant relationship to population, owing to the hook-worm and original sin, but these also introduce variables into the single-tax proposals, and into Professor Irving Fisher's disappearing dollar. If wheat and cotton are to determine the weight of the dollar, and the farmer stays in bed and the nigger goes fishing, the gold miner will have to be driven to work at the point of a bayonet.

I would, nevertheless, put forward a doctrine which may be worth consideration, namely that the commonwealth has a vital interest, and should have underlying control of the superficial quality of land—that is, its area—as no art can increase this appreciably; but the vertical qualities of land, mineralogical and agricultural, are so dependent upon individual art and effort that it is the height of economic wisdom to leave them to the individual, along with self-operating penalties in the form of taxation. More than ever you will find that the land-owner will work while you sleep.

As for gold, give it its due even at its obsequies. As long as armies and navies are considered necessary, so long will gold be demanded by our more suspicious and less sophisticated neighbors. Silver will do for China and India, and colored cottons for the South Sea Islands. It is all a matter of education. But if we can within our own national borders put away these childish things the national dollar might well be a suitable fraction of a man-acre-year and the total basis for our negotiable securities a proper capitalization of the net yield of our man-acre-years, with an identical incidence of pro-rata taxation sufficient to provide running expenses and a sinking fund for our signature paper, known as Government bonds.

The final conundrum is the conversion of our man-acre-years into a form acceptable to foreign trade. It looks difficult, but I think would mean the payment of balances in ounces of fine bullion at market price. This may be too simple, but it would solve one domestic problem. Gold mining would become again an art motivated by interest instead of habit.

A general diagnosis of the whole situation, then, is:

The United States is probably collectively richer than it ever was before, but there have been extraordinary re-concentrations of wealth during the unprecedented disturbances of war.

This wealth is mainly modest, and normally tends to keep out of the way of the tax-collector, and the bulk of it can be found hidden in land of the alleged greatest potential earning power.

The most just approximation of potential earning power can be arrived at by using population as a determining factor, for where the honey is, there will the flies be gathered together.

The essential factors of our current wealth are population, acreage, and time. These capitalized might be most safely made the basis of our negotiable securities, or in other words, our currency.

The product of these essential factors should also be the basis of our underlying domestic expenses or taxes.

Taxation and currency, then, should be vitally related and in direct proportion, both based on the sources of our wealth, but the worm in the bud of this entirely logical scheme is probably the hook-worm.

DAVID ATKINS.

San Francisco, Cal., Feb. 19, 1920.

## Trained Men at a Discount?

We have read with interest P. B. McDonald's communication of Feb. 2 and agree with his views in every respect. The pay of the young engineer (and some of the older ones), is indeed a grievous subject, and it is necessary that older technical men come to the aid of their junior "brethren in misery." The idea of small pay coupled with an opportunity for gaining large (?) experience being satisfactory compensation is becoming a much abused and antiquated one, and can only be overcome by united efforts and co-operation.

We would call Mr. McDonald's attention to the fact that the technical engineers of this country have organized in such a manner as to maintain individualism and independence, and at the same time influence conditions politically and economically, both for the benefit of themselves and everyone else. The American Association of Engineers, an organization of over 11,000 technical men, and the largest technical society in the world, hopes by means of progressive education and co-opera-

tion ultimately so to alter conditions as to overcome the discount on the services of our trained men, and make their services appreciated. The association referred to is not in any sense a labor union and is not affiliated with the American Federation of Labor.

We do not believe, as does Dean Ketchum, that a man just beginning a career as an engineer should be rated so far beneath a carpenter, to use a specific example. Recently we have had some rather sad experiences with carpenters, but we must admit there are good and bad carpenters. However, we were compelled to pay full union wages for some of the inferior variety, whose work was necessarily performed twice. It would seem to us that a newly graduated engineer is not of less value than such a class as just described. In fact, should a college graduate a man, the value of whom the dean gave such an estimate, it would not speak very highly of the abilities of that dean or his subordinates as instructors, or the standing of his institution of learning.

Our medical, dental, and law colleges have never instilled into the minds of their undergraduates that, upon completing their courses, they would be compelled to struggle along for years to eke out an existence. On the other hand, students in these colleges are taught to enter the practice of their professions and receive the same remuneration from the beginning as that received by their older and more experienced professional brothers. And the national societies to which these men belong back them to the limit. The professors in our technical engineering colleges have for years followed the reverse course, and as a result engineers have gone out into the world with an idea that they are not entitled to more than a bare living wage. This practice must stop before the young engineer can have any confidence in his own ability and become one of the leading men of his community, which position rightfully belongs to him. Is not the young engineer of as much value to the community as the young doctor, dentist, or lawyer?

Inspiration, Ariz., ROBERT S. ALLEN.
Feb. 20, 1920. C. B. ALEXANDER.

## Canada's Alleged Autonomy

The *Canadian Mining Journal*, in its issue of Jan. 16, commenting upon an editorial which recently appeared in the *Engineering and Mining Journal* on the League of Nations, objecting to the plural vote for the British Empire, remarks that the article "betrays a curious inability to understand the status of Canada." Referring to British colonies for which votes are claimed, our contemporary goes on to say that "each of the peoples so named constitutes a self-supporting, autonomous, sovereign nation, and if this fact is not understood throughout the world, it is only possible to express surprise." The *Canadian Mining Journal* betrays a curious inability to understand the English language when it describes Canada as an autonomous, sovereign nation. Canada went to war automatically as soon as England declared hostilities. Her government pledged aid to the Allies, and preparations for an expedition were under way on an extensive scale long before the assent of the Canadian Parliament was asked as a mere matter of form. During the controversy which ensued the principle that "when Britain is at war Canada is at war" was accepted by all parties with the exception of the Quebec Nationalists. How can a country claim sovereignty and nationhood when it is bound to render military aid to a suzerain power whenever the latter demands it?

Lord Robert Cecil, a prominent advocate of the League of Nations, in a recent speech displays the same "curious inability to understand the status of Canada" at which the *Canadian Mining Journal* can only express surprise. He is reported as saying that "We could not continue indefinitely the system by which the direction of our foreign policy was exclusively in the hands of the mother country, though any blunder in it might affect the prosperity and possibly the national existence of all parts of the empire." In the face of such an admission the claim that Canada and the other Dominions are entitled to representation in the League as autonomous and sovereign states is preposterous.

PHILLIPS THOMPSON.

Oakville, Ontario, Feb. 16, 1920.

## Hampering Development of Natural Resources

An award has been made to locators of oil lands in the Swift Current country, northwestern Montana, within the so-called Glacial Park, in the sum of $16,000. The order directing the allowance of the sum named was handed down by a commission sitting on the case in proceedings by the Government to get the locators out of the "park."

The "park" is, like the woods of northern Maine, Michigan, or Canada, an almost primeval, virgin, mountain and forest country, in which residents of this part of the world used to enjoy hunting, fishing, and camping. Other than this, there are its natural resources.

Some years ago oil was prospected for and discovered. The Government admits the fact; admits the validity of the locations, the expenditures, and other compliance with Federal requirements; else, failing to oust these pioneer oil men through other means, the Government would not have had recourse to condemnation proceedings to drive them out.

With its right hand the Government makes laws to encourage the development of our natural resources and to increase the wealth of the nation (incidentally, this part of the country is paying a high premium on oil, gasoline, and other petroleum products) while, with its left hand, the Government suppresses the inception of industry, of development, and *drives out* the man who is willing to risk his money in proving up new territory and advancing progress.

The oil has been proven. The Government does not deny this fact. Locators have complied with the laws. Otherwise proceedings of a different nature would have been held against them. Failing otherwise the Government, our Government, the oil man's Government, proceeds to drive them out.

Finally, the fact stands out that development is to be suppressed and the greatest good to the greatest number made subservient to officialdom.

It is not that there is no oil, or that the locators have not complied with the law, and therefore must get off; it is not that they have the oil, have complied with the law, and therefore may have the rights that the laws of the country give them. No, they must get off. What law, what justice, what right is there in this, either to the locator, or the citizens who would benefit by the development of such natural resource? L. S. ROPES.

Helena, Mont., Feb. 23, 1920.

# By The Way

## Much Too Much

Marshall O. Leighton, who recently addressed the mass meeting of engineers in New York on the need of a National Department of Public Works, was asked "what professional politicians thought of the proposed department." With a smile Mr. Leighton replied, "One politician, and a typical one, said, 'This is so good it ought to be enacted at once. It is also so good that it is too much to expect it to be passed in the present session.'"

## Simplified Spelling

Mr. McGinty has written to inquire what others think of simplified spelling, at the same time expressing himself forcibly upon it:

Mistr Editr:

Wanst befor I addrest yur paper abowt this hir nu simplifyd "spelliag". I see by a nu surkulur leeflet that an Institut mimber owt in the gloryus state av gold an' sunshine, froots an' flowrs, razins an' nuts is stil enthusyastik abowt puting it ovr on the Institut. What astonishes me is that he stil spelz his nam the old-fashund wai insted av ritin' it "Shokli".

I hav bekum partly rekunsyld tu the inovayshun, but I wud lyk to no whot uthrs think abowt the greatly improvd wai av ritin' the word "spelliag" az emploid in Mistr Shokli's argymint av Oktobr 26, 1919, in the Institut surkulur.

This simplifyd "spelliag" bizniz is tu mutch lyk the Bolshevik sistum av simplifyd maridj, whitch thai kolz nashn'lizin' the wimmin. "Spelliag" ain't spellin'. It's onli a wai av nashn'lizin' al the letrz av the alfaabet. With gud old-fashund spellin ye can tell the ansistry av anny rayspictabul wurrd by lukin' at the sweet litl face av it. If ye don't need it, ye can always sind it hom or sum gud kind mish'nary diksh'nary will nurs it til it's wanted.

But with "spelliag," whitch sum folks wud like to father, al thim nu wurrds is plain bastards; havin' no mother tongue, at-all, at-all. Will the Wimmin's Awgzillery av the Institut tol'rayt sich goin's on? BIL MCGINTI.

Nu York, Jan. 29, 1920.

## Chuckawalla Code

The constitution of the Chuckawalla Society, with headquarters at Randsburg, Cal., provides that no man who has violated desert law, or who at any time in any place has been in jail, or who has abused the confidence of the outlander who "grubstaked" him, or who has sacrificed his personal credit on the altar of greed and graft, shall be eligible for membership. The society was organized in 1917 in Revenue Canyon, Argus Range, Inyo County. Its membership is limited to residents of the desert section of Kern, Inyo, and San Bernardino counties, California.

## A Desert Disaster

Down in the Joplin-Miami zinc field the Blue Mound Mining Co. recently built a narrow-gage railroad across the principal road leading from Joplin to Picher, Okla., and stationed a superannuated miner as watchman to prevent a collision between automobiles and the little steam locomotive. The track is just north of the Kansas-Oklahoma state line, a location that has long been a favorite one for officers of the law waiting to waylay reckless citizens who attempt to make money out of the fact that Oklahomans are thirsty and anxious to pay a good price for wet goods that the daring bring from Joplin. Recently, just at dusk, an automobile came racing down from the north just as the little locomotive was about to take possession of the highway. The old watchman hastened to flag the driver, who, after he had stopped his car, took one look and then reached hurriedly behind him, drew out a bottle and crashed it on the hub of the car. "I give you my world, officer," he said, "that's every bit I've got!" Whereupon the old watchman, gazing sadly at the broken bottle, exclaimed, "You damn fool! I'm a flagman, not an officer, 'nd I wish I'd let you run into that engine; couldn't 've done no worse than's been done!"

## The Prospector's Lament—A Waltmasonette

While the engineers keep saying that the prospector has quit, or he ain't so energetic as he one time used to be, there's a reason for his slackin' and if you will wait a bit, I think that I can make it just as plain to you as me. First: go back a score of years or more to the good old palmy days when a man was treated like a man, so long as he played straight; and he wasn't bein' pestered to reform or mend his ways, and didn't worry much about the walkin' delegate. And could always get a grub-stake and his credit all the time was as good as any banker's, though his settlements was slow; he could pay his bills by workin' through the winters at some mine where the boss was glad to see him come and loath to see him go. The ranchers used to help him, and the U. S. G. S. boys always gave him a few pointers when he'd stroll into their camp; and his yarns (for compensation) added somewhat to their joys, for they knew him as a worker, not some good-for-nothing tramp.

You would never call him vicious, 'tho he had a vicious rate of workin' at a faro bank or buckin' the roulette, and he played a middlin' hand at draw, and took his liquor straight, but in spite of all his failin's he would be prospectin' yet, if it hadn't been for copper bein' found in country rock where they put up an oil derrick to sample out the vein; if it hadn't been that silver dropped so nearly out of hock that the prospects was it never could be brought to pay again. If it hadn't been that even gold was gettin' hard to sell and he sometimes couldn't sell or even give his lead away, and it surely was amazin' how the smelter rates ain't fell and the "wops" that worked as miners wasn't worth a buck a day. Yet with all the prices droppin' the costs was on the stack and National Parks took so much land there was no place to go, so in spite of all the distance, he loaded up his jack and crossed the Rio Grandy for a chance in Mexico.

Now, there ain't no use denyin' that the game was somewhat tryin' when they started revolutin' and some bandits stole his mules, and, a-thinkin they was strayin' he sets out to do some tyin', gets back to camp and finds they've stole his grub and clothes and tools. There ain't no use a dwellin' on the treatment that he gets, if he called upon a Consul (him that works for Uncle Sam)—(if you've been there you've found that out, if not, just place no bets, for all the help you'll get from them ain't worth a tinker's damn). And he has to hunt a job back home, but it's no work for a miner (they run a sawmill cuttin' stulls where they don't do cave stopin'; and the single-jack has been put out by a thing called Water Leyner), and the wops and bohunks gets the jobs as soon as they are open. So he hunts a job from camp to camp or takes a chance that's given, and husks the pun'kins, stopes the spuds—forever recollectin' that this Gov'ment seems to try to stop his makin' of a livin', in the way he's most familiar with—Prospectin'.

The game's not like it used to be, 'tho it's no less interestin'; but the man who finds a claim to sell has just begun his toil—for the man who used to look for mines and was open for investin', is doin' all his plungin' in the newer game of oil.

# Deficiencies in American Mining Laws

## Importance of Patenting Mineral Claims—Difficulty of Fixing Markings in Slide Rock—Federal Statute Compelling Recording Advocated—Need of Arousing Interest and Discussion by National Bodies and the Public

BY A. E. RING
Written exclusively for *Engineering and Mining Journal*

THERE has been considerable agitation during the last few years in regard to the remodeling of the Federal mining laws, looking toward the elimination of the so-called "Law of the Apex." Most engineers agree as to the deficiencies of this law, but also that the abolishing of extra-lateral rights would cause further extensive litigation. It is doubtful whether such a radical change will ever be effected. However, there are many other provisions of the Federal laws which are seriously in need of modification which will at least do away with some of the causes of dispute between owners of patented claims and decrease the expense of holding and possibly of marketing such claims.

Every engineer who has had to survey or have surveys made of patented claims has had to deal with the "missing corner" problem. American laws call for a stone monument or a 4 x 4-in. post at the corners of a claim. The stone monument frequently consists of a more or less durable stone, which, after a few years, often mysteriously disappears.

If it is on ranch land, it may be plowed up; if on a hillside, buried or washed away; if of granite or some similar rock, it may easily disintegrate and become unidentifiable. If a post is used, it rots off at the surface of the ground in a comparatively short time, and the corner is lost; if the post is on a steep hillside in districts where the snowfall is heavy, a small snowslide will often destroy it; if on slide rock, it may or may not last a while, but in any event is extremely unstable. The net practical result is that a few years after the survey is actually made, it is the exception to find all of the corners of a claim in place on the ground, especially in mountainous country.

### CORNERS LIMIT CLAIMANT'S OWNERSHIP

There are bound to be errors in the surveys of claims not contiguous. These may be small and due to the roughness of the country or of greater extent due to an error of the surveyor. When the ground between such claims is eventually covered and surveyed for patent, these mistakes cause endless trouble, which may, in fact, be the primary cause of litigation, when the corners of the previously surveyed claims are not in place. It is also often found that, though the figures as given by certain patent surveys show the ground to be all taken up, the actual corners in place on the ground show the existence of a fraction. The converse of this is also true; namely, that the patent notes may claim more ground than actually exists. If the corners are in as originally placed by the deputy surveyor, this trouble can be corrected by resurveys, as the courts hold that the corners on the ground limit the claimant's ownership, even though the notes may call for additional or less ground.

It would therefore seem that if the law compelled surveyors to place more permanent corners much of this difficulty might be obviated. A piece of rail or a pipe of. say, two or three inches diameter, driven three to four feet into the ground, would make a far more durable corner than the present post or stone. The number and corner of the claim could be stamped on such a corner with little more trouble than is caused by the present scribing or chiseling methods.

The placing of corners is also an important matter. I had occasion recently to survey the surface work on a group of claims lying on a steep hillside in Colorado. In searching for the claim corners to connect the work with the patent surveys, I was able to find but one corner out of the six which were situated on the endlines of the four claims on one end of the group. This corner was on the crest of a ridge, and well protected from the elements.

### THE "WITNESS CORNER'

Where the corner falls in slide rock, it is a hard matter to establish anything like a permanent corner. The stone monument is absurd and the wooden post is far from satisfactory. Where there is slide rock, there is usually a cliff or solid outcrop somewhere along the claim line within reasonable distance of the position of the corner, and it would seem that a small piece of three-quarter or one-inch steel or pipe set a few inches in this as a "witness corner" should be required in addition to the placing of temporary corners at the corners' correct position. At present, such a "witness corner," or what the law allows to pass for a corner, is required only where the actual position of the corner falls in an inaccessible place. The deputy surveyor, however, almost invariably places his corners in their true location if there is any possible way of doing so, no matter if the corner falls in a creek bed, a swamp, a ditch or on slide rock, and such a corner is almost worthless. Further, "witness corners," and sometimes corners themselves, are occasionally established by chiseling a cross on a boulder or face of a cliff. This practice should be prohibited. The rock wears away in time from ordinary weathering, and the corner is lost, or it may easily be covered up so that one cannot find it.

Another matter which, though hardly a cause for legal difficulties, is nevertheless a source of much annoyance, is the practice of giving the same survey number to each and all claims surveyed as a group, as is done in Colorado. The engineer, trying to locate himself on the land covered by such a group of perhaps ten claims, finds a corner marked, say, 4/8275. There are in this group ten claims, and therefore ten corners similarly marked. Unless he happens to know the ground, or can identify the corner from some natural object, he is kept guessing until he finds other corners and can compare relative positions. The only excuse for this practice appears to be a slight saving in the duties of the indexer in the surveyor general's office. There is no good reason why each claim should not have

a separate number so that the finding of any corner of it on the ground will immediately establish the position of the claim.

There should be a Federal law making it compulsory that anyone obtaining a patent for a mineral claim should have the patent recorded in order to complete the validating of his title. Ownership of real estate must be proved by a recorded deed. If such deed were burned or lost without having been recorded, the holder would lose his title to the property. Why should a patent from the Government be regarded in any different light? I would go even further and suggest that every survey for patent should be recorded in the county in which it is situated, no matter whether application for patent is made or not.

Probably the best way to obtain action on questions of this kind is to start an open discussion in the pages of *Engineering and Mining Journal* and eventually to get the larger mining societies to bring them before the proper legislative bodies. The country will never have better laws or find remedies for the faults in the present ones unless such matters are taken up by national professional organizations and brought before the public, the profession interested, and the legislators.

## Miners and Brenners' (Smelters) Standard Dish

By A. H. Fay

Written exclusively for *Engineering and Mining Journal*

IN THE old days there was no Bureau of Standards or International Bureau of Weights and Measures but in spite of that fact, vessels of lawful dimensions were preserved for the convenience of industry. The accompanying illustration shows the miners' standard dish as used in the County of Derby, England, in the sixteenth century. The inscription on the dish bears the date Oct. 4, 1513, as indicated in the following paragraph, which is a verbatim copy of the original text:

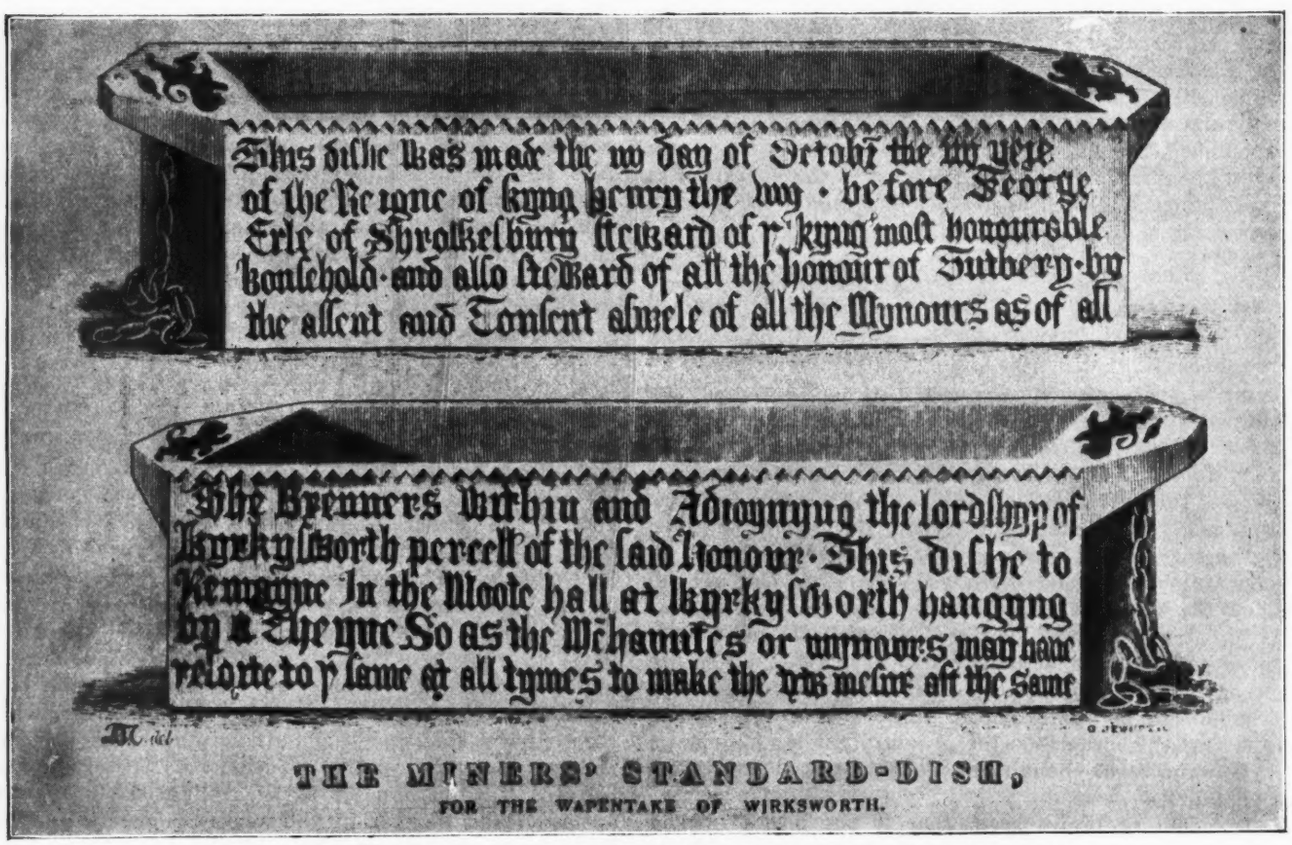
"This Dishe was made the iiii day of October the iiii yere of the Reigne of Kyng henry the viii, before George Erle of Shrowesbury steward of ye kyngs most honourable household and also steward of all the honour of Tutbery, by the assent and consent as well of all the Mynours as of all.

"The Brenners within and adjoining the lordship of Wyrkysworth percell of said honour. This Dishe to Remayne in the Motte hall at Wyrkysworth hangying by a cheyne So as the Merchantes or mynours may have resort to ye same at all tymes to make the trw mesur after the same."

The figures at the top and on the ends of the dish are rude representations of "talbots rampant," the armorial bearing of the Earl of Shrewesbury. From measurements taken by William Sherwin, clerk to Charles Hunt of Wyrkysworth, the dimensions of the dish are found to be as follows: length at the top, 21.5 in.; length at the bottom, 20.7 in.; width at the top, 5.3 in.; width at the bottom, 5.2 in.; depth, 4.26 in. The sides are slightly curved. From these dimensions, the dish is calculated to contain 472 cubic inches, or 14 1/21 pints dry measure. This was a standard of measure used in the lead mines.

This illustration was taken from the "Derbyshire Miner's Glossary," published in 1824, by James Mander, mineral steward to His Grace the Duke of Rutland and the Right Honorable Earl of Newburgh.

It affords an interesting insight into the customs of the early miners of England. Agricola gave similar descriptions of German mining customs as well as illustrations of ancient smelter's practices.




REPRODUCTION OF AN OLD PRINT SHOWING THE MINERS' STANDARD DISH

# Recovery of Caved Stopes

## Successful Method Evolved at a Mine in the Slocan District of British Columbia To Meet a Difficult Situation—Details of the Respective Steps In the Process

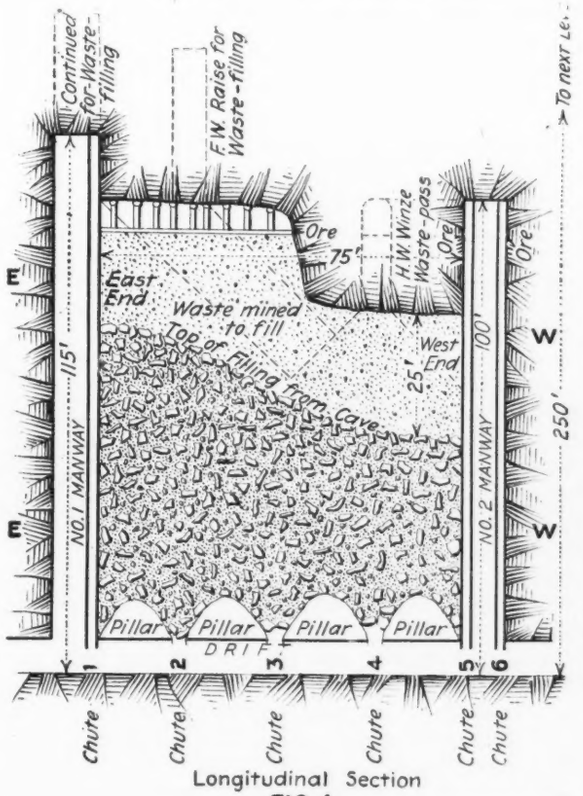
BY DOUGLAS LA.
Written exclusively for *Engineering and Mining Journal*

INSTANCES of caving and subsequent recovery of stopes are of interest, inasmuch as the expedients adopted, in whole or in part, may be of service to others in a similar predicament.

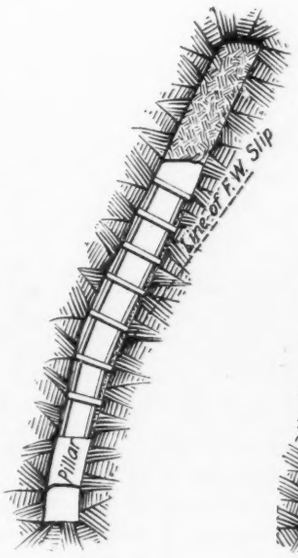
A cave occurred at a mine in the Slocan district, British Columbia. A milling orebody had been opened up by two raises (shown in the longitudinal section as No. 1 and No. 2 manways) at points 75 ft. apart in a drift. The latter showed but little ore in the back, whereas both raises disclosed good ore within a very few feet of the drift. Consequently, prior to commencing stoping, it was decided to leave a pillar of ground in place immediately above the drift, about 10 ft. in thickness, through which short raises were run at intervals of about 15 ft. to serve as ore passes, this procedure dispensing with timbering the drift and opening up the stope in the customary way.

The need for milling ore being urgent, shrinkage stoping was not adopted. Both walls were apparently good; accordingly, the stope was stulled in the usual way, and all ore withdrawn as soon as broken. Before stoping began, No. 1 manway had been carried up to a point 115 ft. above the drift, had run out of ore at 100 ft., and had been discontinued. No. 2 manway was up a distance of 30 ft. and was kept in advance of the western back of the stope. The vein dip was about 75 deg. The vein filling consisted of brecciated quartz, with galena and blende, and exhibited the customary hardness of the ore-bearing filling in this mine. The average stoping width was about 10 ft.

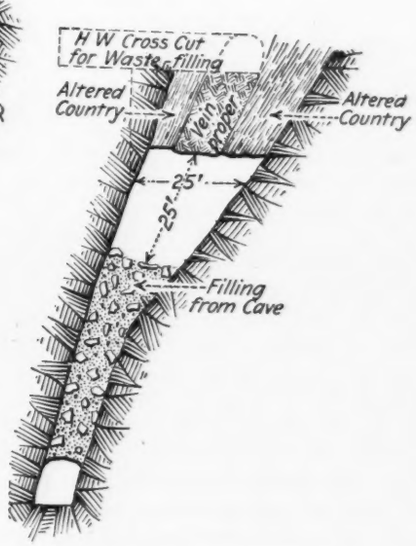
At first the best ore was found in the eastern portion of the stope, and to meet the exigencies of the ore situation, that portion of the stope was attacked more vigorously, and, consequently, the western portion of the back was lower than the eastern.




Longitudinal Section
FIG. 1




Cross Section before Cave
FIG. 2




Cross Section after Cave
FIG. 3

DIAGRAMMATIC ILLUSTRATION OF DETAIL IN RECOVERY OF CAVED STOPES

No trouble whatever was experienced until the back of the western portion of the stope was about 40 ft. above the drift. At this point the vein began to flatten off considerably, and the foot wall became very soft, necessitating posting of all stulls and lagging of the foot wall. The ore being extremely good, stoping was temporarily suspended and a close inspection made of all stulls at lower points.

It was considered that, in view of the strong upward and westward trend of the ore, a large body was yet to come under extraction, and therefore considerable expense in the way of reinforcing timbers was justified. All lower stulls were therefore posted on foot and hang-

ing walls, and the entire foot wall was lagged. Stoping was then again resumed, but it was further decided to allow the stope to fill and to mine thereafter by shrinkage. To break the fall of ore until the stope filled, it was also decided to half lag floors at intervals on foot and hanging walls respectively.

Soon after resumption of stoping, one night a crack developed close to the back of the stope, which extended throughout the stope, approximately paralleling the back. It then seemed only too likely that an extensive slip of the foot wall was imminent, which nothing could avert. Accordingly, all men were at once withdrawn from the stope. The following night the entire foot wall caved, taking out all timber and causing further caving of the unsupported hanging wall. Fortunately, both No. 1 and No. 2 manways were left quite intact, but all chutes were left unavailable except No. 6 chute of No. 2 manway.

The back of the stope itself did not cave to any appreciable extent, caving being confined to a thickness of about 10 ft. of altered ground in the immediate vicinity of the foot wall, and to the hanging wall, which caved to a width of about 5 ft. The material from the cave, consisting mainly of large blocks, filled the stope to within about 25 ft. of the back. The height of the back from the filling precluded entry into the stope, owing to the danger of falling masses.

It was evident that, apart altogether from the danger involved, the question of timbering the entire stope from muck pile to back could not be considered, by reason of the expense and the time it would occupy. Obviously, the best course was to fill the stope with waste to within a few feet of the back, to prevent any further movement; after which it was decided to create an intermediate drift by drifting eastward from the top of No. 2 manway (which was up 100 ft.) level with the back of the eastern portion of the stope, and where this drift entered the cave square sets would begin on top of the filling and be continued to No. 1 manway. Along this intermediate drift, ore extracted above would be trammed to No. 6 chute of No. 2 manway.

It was decided to fill the stope with waste by continuing No. 1 manway upward at the east end. Waste for the western portion was supplied by driving east from the top of No. 2 manway for a distance of 20 ft., then crosscutting to the hanging wall, and sinking the distance of approximately 15 ft. to connect with the caved stope. This winze constituted a pass for waste got by continuing the crosscut into the hanging wall. Moreover, it was obvious that it would serve not only for filling the caved stope but also for filling the space created by the extraction of the rectangular block of ground immediately adjacent to the winze, when this should come under attack.

The foregoing program was put into effect, filling proceeding at both ends of the stope simultaneously, without hitch of any kind. When the angles of repose had been reached by the respective muck piles at each end of the stope, the muck from No. 1 manway was shoveled ahead and toward the hanging wall, and timbering was started on the foot wall on top of the muck pile, and continued for a distance of 20 ft. This enabled a small foot-wall raise to be run up in the foot wall at this point, which furnished the remaining waste necessary to complete the filling of the stope.

It now only remained to complete the intermediate drift mentioned to render the immediate resumption of stoping possible. The outbreak of the Great War, however, prevented my witnessing the actual extraction. It might be added that plans for the continuation of shrinkage stoping above the intermediate drift provided for putting in a row of stulls about 6 ft. above the intermediate drift timbers. Though the ore chutes were to be in the latter, the weight of broken ore in the stope would be taken by the stulls, and thus any trouble resulting from settlement of sets on the muck pile would be avoided. Holes were to be left in the lagging over the row of stulls on the foot-wall side at points midway between the chutes in the intermediate drift timbers. The latter is, of course, standard practice at some mines where shrinkage stoping is the rule, but in this particular instance the essential idea of the row of stulls was to take the weight of the broken ore off the intermediate drift timbers, rather than to afford a means whereby large pieces of ore could be broken before reaching the chutes.

## Do Not Throw Away the Slacked Carbide

BY HARRY E. SCOTT

There are not many who realize the different ways slacked carbide, the fine screenings from the miners' lamps, can be used. As a rule the miner dumps the carbide out of his lamp into a box when he comes off shift, and later this is screened and the coarse is saved for use again, the fine thrown over the dump or left for the wind to blow away. A much better plan would be to put it in a can or box with a cover and stand it in a convenient place where engineers, hoistmen, and mechanics can get it.

When a brake becomes slick and slips, or sticky and catches too quickly, as it often does, a little of the carbide dust sprinkled on will remove the cause by absorbing the oil and grease, making a friction which will hold the load and not stop the cage, skip or bucket with a jerk when the brake is applied. When the clutch slips and will not pull the load, carbide will cure it as well as it does the brake; that is, provided the clutch is not too loose.

In nearly all hoist rooms and power plants there are places where it is almost impossible to keep the oil from running out of a bearing and down the engine bed onto the floor and foundation. Where this happens scatter a little carbide dust. It will soak up the oil, and can be swept out when sweeping the floor much more easily and effectively than wiping it up with waste.

Mechanics will find carbide dust useful when overhauling and cleaning old machinery which is rusted. Mixed with water or oil it will remove the old grease, oil, and rust with very little labor.

When the word has been passed down the line to clean up and call out the camera man, and the directors, stockholders, president of the company, or prospective stock buyers are coming, rub the bright parts of your engine with waste dipped in slacked carbide mixed with water. The engine looks better if so treated.

The miner, while "taking five," can polish the reflector of his lamp with spent carbide, take some of it home for his wife or sister (please excuse household hints and farming note) to use in polishing the tin ware, bright parts of the range, and other household goods; and what is left over may be put in the hen's nest

# Identification of Potash Deposits

## Description and Relative Importance of Common Potassium Compounds—How To Judge Commercial Value of Deposits—What To Have Analyzed—Simple Tests for the Prospector

BY WILLIAM H. ROSS AND ALBERT R. MERZ
Bureau of Soils, U. S. Department of Agriculture, Washington, D. C.
Written exclusively for *Engineering and Mining Journal*

THE six leading ore or mineral products normally imported into this country, in the order of value, are Chile saltpeter, potash salts, precious stones, copper ore, petroleum, and iron ore. The annual value of these imports under the pre-war conditions of 1913 ranged from $20,700,000 for Chile saltpeter, and $14,400,000 for potash salts, to $7,000,000 for iron ore. The two most valuable of America's mineral imports are therefore Chile saltpeter, or sodium nitrate, and potash salts. The materials which go to make up both of these classes contain an alkali salt as their essential constituent, and both find the same uses in industries, chiefly in the manufacture of fertilizers and explosives. Both classes of materials therefore serve a useful purpose in times of peace as well as of war.

The value of sodium nitrate lies in its nitrogen, and potassium is, of course, the commercial element in the common potash salts. Although combined nitrogen constitutes the largest mineral import of the United States, large quantities are also produced in this country. An amount almost equal to that normally imported is now being produced as a byproduct in coke ovens and gas plants; a large quantity is also obtainable from many organic wastes; and a smaller amount, but one which may be increased without limit, is obtained by the fixation of atmospheric nitrogen. The supply of sodium nitrate, moreover, was not cut off during the war, and the wartime advance in the price of combined nitrogen therefore amounted to not more than 100 per cent, or about the same as that of many other commodities.

With potash salts the situation was much different. Before the war, this country produced practically none, and no commercial methods had been developed for the preparation of such salts, except to a very limited extent. So when the supply was cut off at the beginning of the war the price rapidly rose, until it became about 1,000 per cent in excess of the normal. With potash at this price, the discovery of a deposit containing a commercial quality of available potash salts would have achieved a considerable financial reward. The interest which had prevailed for some time in the location of potash deposits was therefore greatly increased. This was shown by the great increase in the number of potash samples sent to Government bureaus for examination, which resulted in a large accumulation of work at a time when most of the chemical force was engaged in other war activities. In some laboratories, at least, the increase in the volume of work made it impossible to give prompt attention to all samples received. Reports were often therefore greatly delayed, which caused disappointment to those sending the samples and greatly handicapped them in their search for commercial deposits.

Many, if not most, of the potash samples which are submitted to Government laboratories for chemical examination are valueless as a source of this material. Many are of such a nature that anyone knowing a few simple tests requiring little or no chemical training or equipment should be able to reject them as sources of potash. If this were done, much of the delay and expense involved in sending samples to distant laboratories might be avoided. The object of the present paper is to outline as briefly as possible some simple ways in which potash materials of possible commercial value, may be identified.

### POTASH MAY BE SOLUBLE OR INSOLUBLE

The various forms in which potash occurs in nature may be conveniently divided into two classes: (1) those which are soluble in water, and (2) those which are insoluble. The soluble potash salts may also be considered under two headings: (1) those which occur dissolved in water, as in the brines of alkaline lakes; and (2) those which have been deposited from water as a result of evaporation and that occur in crystalline form.

### POTASH IN BRINES

The total solids in the brines of Searles Lake, California, amount to about 33 per cent, and the potash to 2.6 per cent. The corresponding analyses of Jesse Lake, the largest of the Nebraska lakes, are 13.5 per cent and 4.0 per cent. The cost of recovering potash from the water of salt lakes is in a large measure proportional to the concentration of the potash present. When it is remembered that the concentration of the total salts of sea water amounts to only 3 per cent it will be recognized that before the water of any lake can be considered as a possible source of potash it must have at least a decidedly saline taste. Samples of what appear from the taste to be perfectly good drinking waters are frequently sent to Government laboratories for a report as to their value as a source of potash. The simple procedure of tasting such samples is all that is necessary to class them as being entirely without value for their potash content. This simple test can be carried out by anyone, and saves the trouble and expense of forwarding such samples.

If any given sample is found to have a salty taste, then a chemical analysis will be required to determine the percentage of potash present. Such samples should, therefore, be sent to a laboratory where potash analyses are made. A simple qualitative test which requires little chemical training may, however, be applied. This is known as the cobalto-nitrite method of testing for potash. For this test the sample of water is diluted with about four times its volume of fresh water. A portion of about 50 c.c., or 2 oz., is withdrawn and placed in a small beaker or other glass vessel. A small portion of a solution of cobalto-nitrite is then added If potash be present, the solution quickly becomes cloudy and a golden-yellow precipitate is deposited on the bottom of the vessel. By making up solutions of a potash salt of different concentrations, and by comparing the size of

the precipitate obtained when the cobalto-nitrite solution is added to each with that occurring in the sample analyzed, a rough approximation may be made of the percentage of potash present.

The cobalto-nitrite solution may be made up as follows: (1) Dissolve 55 g. (2 oz.) of sodium nitrite in 100 c.c. (3.6 oz.) of water. (2) Dissolve 28 g. (1 oz.) of cobalt acetate in a mixture of 75 c.c. (2.6 oz.) of water and 28 c.c. (1 oz.) of glacial acetic acid. (3) Mix both solutions and allow to stand under a vacuum for a few hours to permit the escape of the nitric oxide fumes which are evolved. If a vacuum is not available, the solution may be allowed to stand in an open vessel over night. The solution should be made up fresh every few weeks.

### Water-Soluble Potash Deposits

The potash deposits in Germany occur in the form of water-soluble salts. Similar deposits also occur in Alsace, and to a smaller extent in certain other parts of the world, but so far as is known, no such deposits occur in this country of sufficient concentration and extent to make the recovery of the potash a profitable undertaking. The possibility of such deposits occurring in the United States is not excluded, however, and intelligent efforts to find new deposits are in no sense to be discouraged.

The workable deposits in Germany contain upward of 10 per cent of potash. Under favorable conditions deposits in this country might possibly be worked which contained a lower percentage than this, but it is doubtful if a deposit containing less than 5 per cent would be of any commercial value. This percentage of potash, with the other associated soluble salts, would give the material a decidedly saline taste. Any mineralogical formation that is not characterized by a very salty taste is, therefore, of no commercial value as a source of water-soluble potash.

On the other hand, a material may contain a high percentage of soluble salts with little or no potash present, so the taste alone cannot be depended upon to identify potash in such cases. When such a material is found, it should be sent away for chemical analysis, or a qualitative test may be made for potash by means of the cobalto-nitrite solution already described. When making this test, about 2 g. (30 grains) of the sample is crushed to a powder and then dissolved in 60 c.c. (2 oz.) of water by boiling or by allowing to stand over night. The clear liquid is then decanted, or, preferably, filtered off, and the potash precipitated in the same way as described for brines. The filtrate must be perfectly clear before adding the cobalto-nitrite solution. If the solution does not filter or settle readily, a little free lime may be added to the weighed sample before treating with water. When so tested a distinct precipitate will be obtained if the material examined contains as much as 1 per cent of water-soluble potash.

To be of commercial value, a water-soluble potash deposit must contain not only several per cent of potash, but it must also be of sufficient extent to justify development. Many of the samples which have recently been sent to Government bureaus for examination consist simply of surface incrustations of alkali salts. In many or most of these cases if a sample had been taken from a foot or two below the surface no saline taste would have been noticeable. As a rule such incrustations do not contain potash in appreciable amount, but, even if they did, the extent of the deposit, unless it covered an unusually wide area, would not be sufficient to justify development.

Summing up, then, water-soluble deposits are of no commercial value when they do not have a decidedly saline taste; or, having a salty taste, when they do not react for potash with the cobalto-nitrite test; and when they are limited in extent to surface incrustations.

### Insoluble Potash Deposits

In addition to brines and water-soluble deposits, potash also occurs in a number of water-insoluble minerals. For convenience, these may be divided into two subclasses: (1) Those which contain silica in combination and are referred to collectively as potash silicates; and (2) those which are not silicates, of which the most important is a mineral called alunite. The potash silicates, all being insoluble in water, are without taste and cannot be detected by any of the methods already described. The most important of these minerals are orthoclase (feldspar), mica, sericite, greensand, and leucite.

Notwithstanding the extent of the investigation that has been conducted on the extraction of potash from these silicate rocks, only a small amount has been recovered from this source. The reason is entirely an economic one. Many of the processes that have been devised are comparatively simple, and it is possible to bring about a quantitative separation of the potash by several of these methods.

If the percentage of potash in any of the silicates approached that of certain of the metals in many of their ores, the potash question in this country would long ago have been solved. The potash content of all silicates, however, unfortunately is comparatively low, and possibly no mine-run rock has been found anywhere that contains as high a percentage of potash as the developed deposits of France and Germany, in which the potash occurs naturally in a water-soluble form. Therefore, the extraction and recovery of potash from silicate rocks at a price that will compete with the foreign product does not seem to offer much promise unless the potash is recovered as a byproduct in some industry, as in cement plants, in which potash silicates are used. In this way most of the potash so far obtained from silicate rocks has been prepared.

All of the soluble salts of potash have a standard value, which is more or less fixed in normal times and which is dependent on such factors as the percentage of potash present and the distance of the deposit from the potash market. The value of a deposit of potash silicate, on the other hand, is dependent not only on the grade and the distance from the potash market but also, and principally, on the situation of the deposit with respect to an industry which might possibly use it. Certain silicate deposits may thus be of value in some localities but worth nothing in others, and no standard value based on their potash content can be assigned.

Apart from the geological interest connected with such work, little would thus appear to be gained in prospecting for deposits of potash silicates unless this is done under the direction of an organization interested in the production or consumption of potash, or with a view to interesting such an organization. The potash in silicate deposits that are not being used in any industry may thus be said to have a possible, rather than a definite, present value. For this reason certain government laboratories, as the Bureau of Soils, will

identify insoluble mineral samples supposed to contain potash, but will ordinarily not make a quantitative determination of the amount present.

Of the potash silicates which have already been mentioned only feldspar and mica have a commercial value independently of their potash content. Feldspar is used in the manufacture of pottery, enamel ware, vitrified sanitary ware, electrical ware, and other materials of a similar nature. Mica is used as an insulating material and in the manufacture of lubricants and of transparent material for use in furnaces and similar construction. Both of these minerals are of widespread occurrence, but neither is of a commercial value for the purposes mentioned unless it occurs in masses of sufficient purity and extent to admit of mining high-grade material. The same limitations also hold true in a large measure if the minerals are to be used as sources of potash. Rocky mixtures of these minerals with other materials must consequently be considered at present as of little or no value as sources of potash or for any of the other purposes already mentioned. Unless a mineral is more or less uniform in appearance, thus giving evidence of being fairly high grade, the making of an analysis, with a view to using the mineral commercially, is hardly worth while.

Feldspar (orthoclase) is usually white in color, but may be gray, reddish, or yellowish. The freshly broken surfaces are bright and glistening and very compact in appearance. It cannot be scratched with an ordinary knife.

Mica can be easily cut with a knife and is readily recognized by its peculiar property of being divided into very thin sections without difficulty. The physical properties of sericite and leucite are not so characteristic as those of mica, and the identification of these minerals should therefore be intrusted only to those who have had experience.

Glauconite or greensand differs from most of the potash silicates in being soluble in acids. It occurs in sand-like grains which are greenish in color. Owing to the fact that it is soluble in acid, greensand decomposes in the soil more readily than the other potash silicates and is recognized to give good results, in the case of some soils at least, when applied directly as a fertilizer. Unfortunately, the potash content of greensand is low, usually not more than 7 per cent, but, owing to the ease with which it can be mined and decomposed, it may be considered as of more value as a source of potash than any of the other silicates of the same grade and similarly situated.

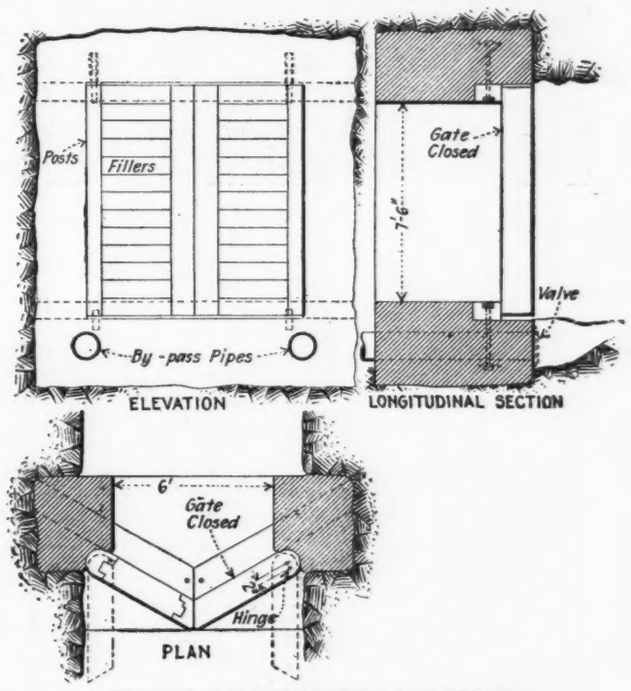
Alunite is a hydrated sulphate of aluminum and potassium. Its color is white, grayish, or reddish. When heated to a temperature of 500 deg. C., or a low red heat, water is driven off and the potash which it contains then becomes soluble. It may therefore be identified by testing for potash in extracts of the mineral prepared before and after it has been ignited. In making these tests, the cobalto-nitrite method may be used in the same way as described for water-soluble potash samples.

Three methods have been recommended and are in use for the quantitative determination of potassium. These are known as the platinum chloride, the cobalto-nitrite, and the perchloric-acid methods. The first is the official method of the Association of Official Agricultural Chemists. In the hands of those who have had experience in potash analysis, highly accurate results may be obtained by this method. Good results may also be obtained with the cobalto-nitrite method, and it is more rapid than that using platinum chloride. Some analysts express a preference for the perchloric-acid method, but it is perhaps less used in this country than either of the others. Directions for carrying out the first method mentioned may be found in Bureau of Chemistry Bulletin No. 107 (Revised); a description of the second is given in an article by Haff and Schwartz in the *Journal of Engineering Chemistry*, Vol. 9, p. 705; and of the third in a paper by William B. Newberry in *Chemical and Metallurgical Engineering*, Vol. 20, p. 452.

## A Timber and Concrete Bulkhead

BY FRANK HUTCHINSON

The construction of a timber and concrete bulkhead which was installed at the Rowe mine of the Pittsburgh Steel Ore Co., Riverton, Minn., is somewhat novel. As shown by the accompanying sketch, the general idea is adapted from that employed in the construction of canal-lock gates. The top and bottom miter sills are firmly imbedded in the concrete housing, and bolted securely in place. The gates are accurately framed, and fitted to the miter sills and the concrete buttresses. The hinges are placed two inches off center, so as to cause the doors to clear themselves promptly upon being opened. By-pass pipes are carried through the concrete housing.

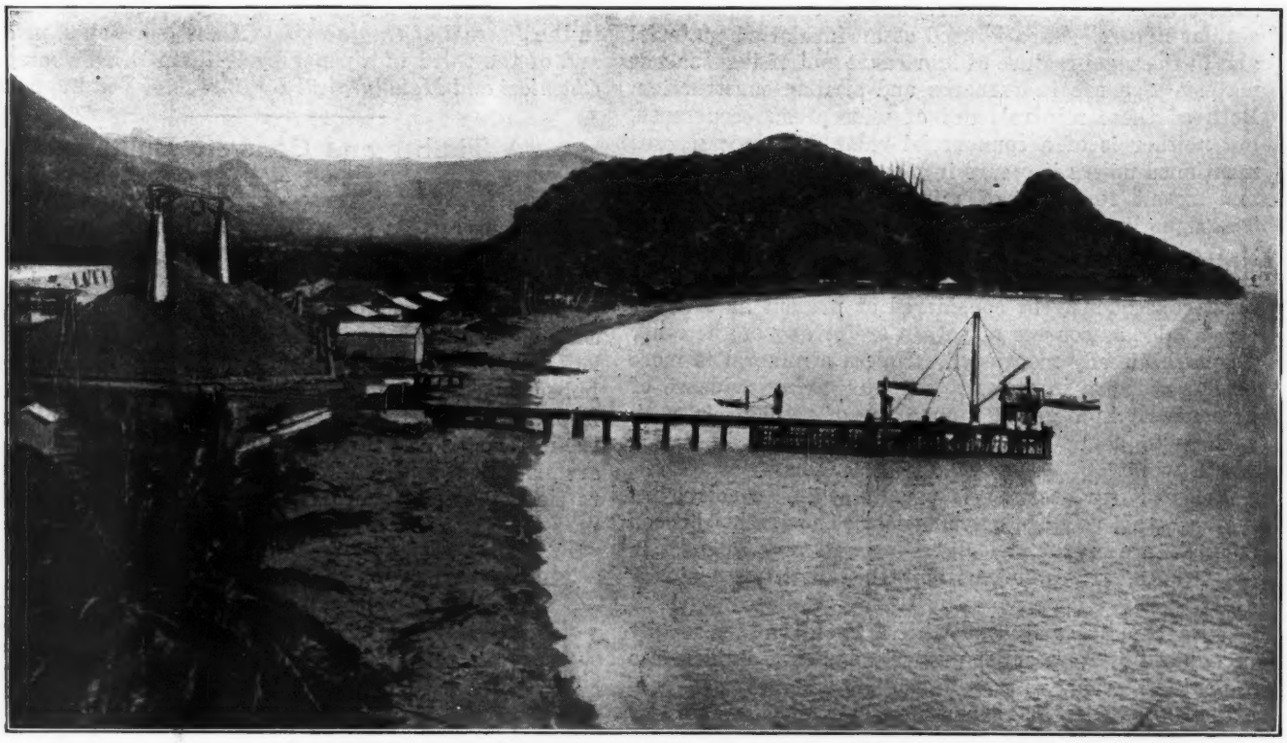



TIMBER AND CONCRETE BULKHEAD

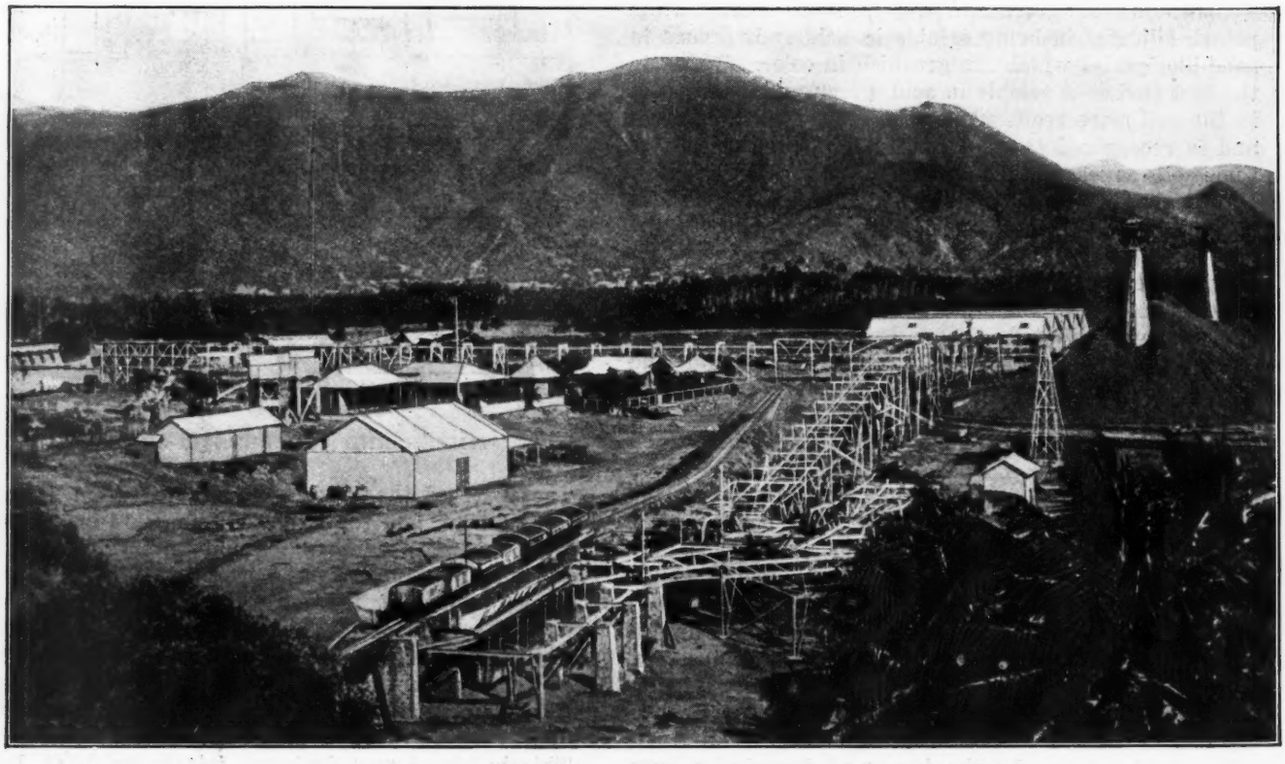
The posts of the gates were framed from 14-in. x 14-in. timbers, and the fillers of 8-in. x 14-in. timbers. The joints between the gates and miter sills, and between the gates themselves, were provided with gaskets to assist in making the job water-tight. Upon initial test with a head of 50 ft. against the gates, the leak amounted to 50 gal. per min. Practically all of this came through the joints between the horizontal fillers; and in the course of a few days there was evident only a slight seepage through the gates.

This bulkhead was designed jointly by J. C. Barr, former general manager, and Frank Hutchinson, former chief engineer, of the Pittsburgh Steel Ore Co.

# Nickel Mining in New Caledonia

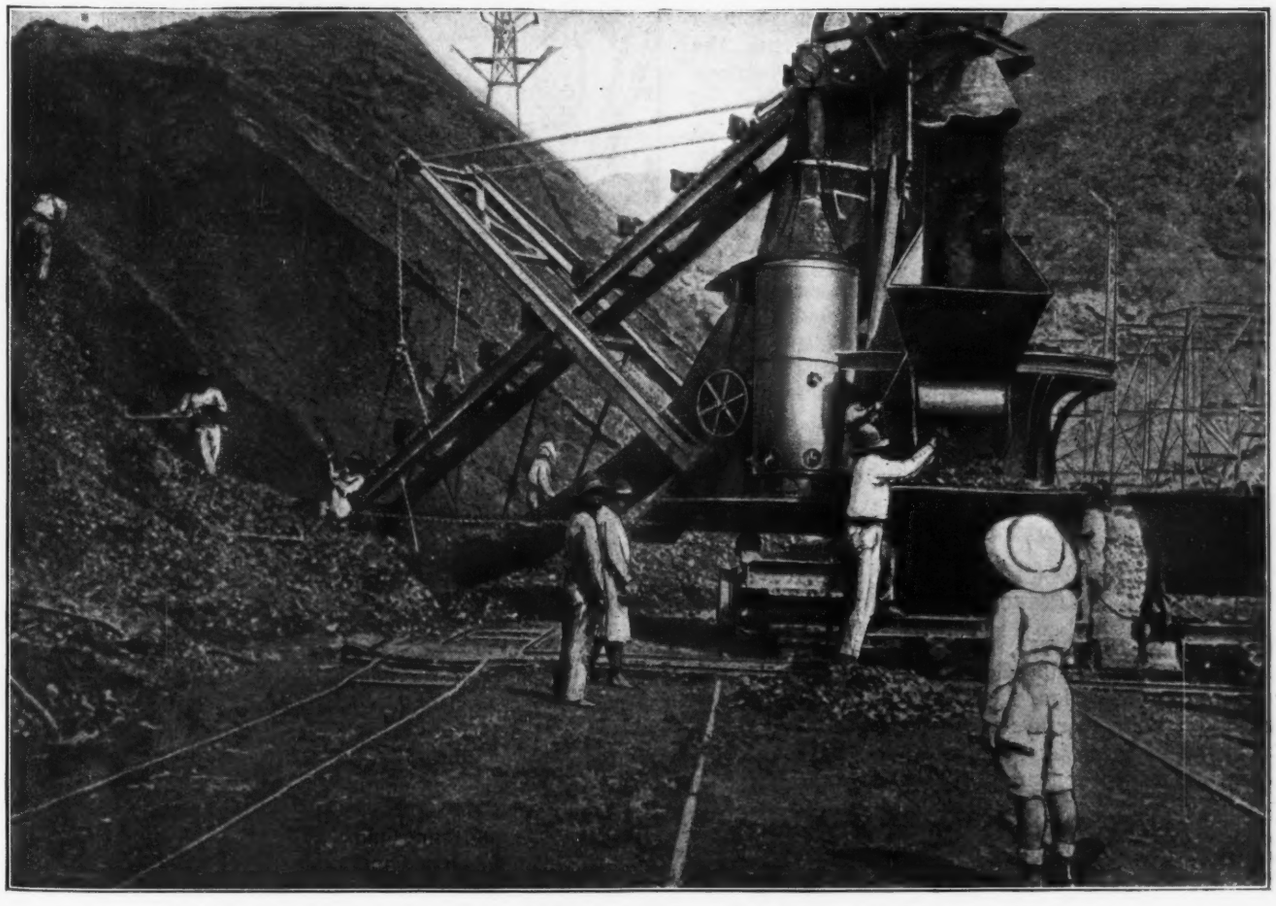


SHIPPING PORT OF SOCIÉTÉ LE NICKEL, NEW CALEDONIA



SMELTER YARD OF SOCIÉTÉ LE NICKEL AT THIO, NEW CALEDONIA

QUARTZ CLIFF AT THE BORNET MINE, NEW CALEDONIA, AND NATIVE HUTS



LOADING STOCKED ORE AT A NEW CALEDONIA MINE PREPARATORY TO SHIPMENT

# Military Mining in France*

## Hand Boring Macnines and Simple Appliances Used — In Rare Instances Rock Drilling Machines Operated by Compressed Air Were Employed—Listening Devices and Rescue Apparatus

BY ALFRED H. BROOKS†
Written exclusively for *Engineering and Mining Journal*

THE colossal scale of the mine attacks and defenses on the Western Front from 1915 to 1917 completely dwarf all underground operations of previous wars. During this brief period the art of mine warfare made more progress than during its entire previous history of over twenty centuries. Underground attacks had, however, reached their climax and were on the wane before American troops arrived in France. Therefore our soldiers took no active part in mining operations, and there were relatively few American officers who became acquainted with mine warfare by personal observation and experience. Preparations had, however, been made for this branch of military engineering by the organization of a mining regiment (27th Engineers). This regiment, commanded by Colonel O. B. Perry, and with carefully selected personnel of both men and officers, saw much active service, and was not used for mining.

Soon after the First Battle of the Marne, both combatants began entrenching in certain sectors. During the succeeding four months, the line swept back and forth, but gradually became stabilized, and with this the trench systems became more elaborate. The early trenches were only crude shelters prepared by the infantry with the simplest tools, but these finally developed into elaborate systems of defensive field works, entirely new in warfare and requiring the highest degree of military engineering skill. Positions were elaborately organized, with numerous lines of trenches and entanglements flanked by machine-gun emplacements and including numerous strong points. These lines were in some sectors connected by shell-proof subways. Above all, these positions included deep dugouts invulnerable to even the high-explosive shells of the most powerful artillery.

Eventually, these two great opposing systems of field works swept almost unbroken from the English Channel to the Swiss border, and therefore presented no vulnerable flanks. It seemed for a time as if these fronts were impregnable, except in certain sectors where the geologic conditions prevented elaborate underground works. The war had apparently reached a deadlock, for most of the attacks resulted simply in the opponents taking a stronger position to the rear and sweeping forward again as opportunity offered.

### HAND BORING MACHINES AND ACOUSTICAL INSTRUMENTS

Hand boring machines were the most important excavating tools introduced into military mining during the war (see Figs. 1, and 3). Of far greater influence on mine warfare were the several acoustical instruments invented by the French and used to locate the position of the enemy's operations accurately.

Mining is controlled in greater or less degree by all the factors that affect military operations, such as relative strength and morale of the opposing forces, distance of objective, means of transportation, availability of material, and similar factors. In mining, however, the underground condition, or the geology, is of first importance, and in the interest of success must be determined before entering upon any project. In many positions the geologic conditions—presence of ground water, toughness of bedrock, broken character or looseness of strata—may be such as to make military mining impracticable. Be it remembered that mining is feasible only when in close contact with the enemy and must, therefore, be carried on under the most adverse conditions.

On the amount of relief, and the vertical relations of the two opposing positions, will depend the type

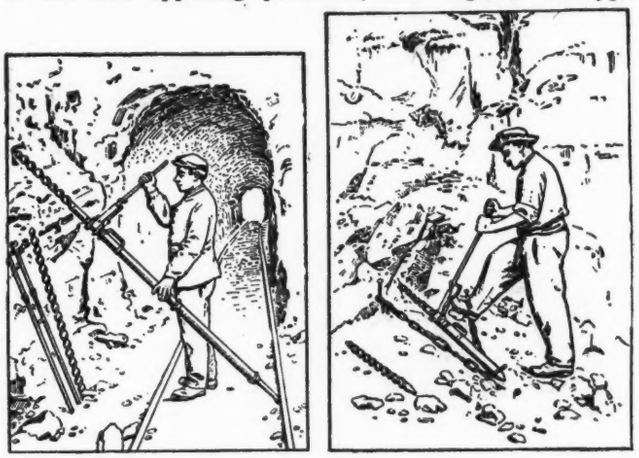


FIG. 1. FRENCH HAND ROTARY DRILL WITH EXTENSION BAR, (LEFT): FRENCH HAND ROTARY DRILL HELD BY CHAIN, (RIGHT)

of mine entrance, whether by gallery or shaft. Evidently, also, the relief will determine the possibilities of the natural drainage of galleries and the amount of overhead cover attainable. The surface features of any given region, therefore, exercise a strong influence on the method of mining. If, for example, the opposing lines are located on a plain, it is evident that attack or offensive mining works must be initiated by shaft sinking, with its attendant difficulties of hoisting and possibly of pumping. On the other hand, if the relief be sufficiently strong to permit of driving galleries from the surface, especially if they can be given an upward slope for drainage and to help the transportation of spoil, underground operations will be greatly facilitated.

One of the first principles of underground warfare is that operations should be carried on with as little noise as possible, so as not to reveal the position of the mines to the enemy. It is evident that the audibility of mine operations will depend on the hardness and

*Released for publication by permission of the Director, U. S. Geological Survey.

†Formerly Lieutenant-Colonel Engineers and Chief Geologist of American Expeditionary Force.

toughness of the rock, as well as on the mechanical means used in excavation. It should also be noted that sound is transmitted more readily by the solid formations than those that are incoherent. It is evident, therefore, that the mining of the hard rocks will be heard at far greater distance than of the soft material like clay or sand.

The ground-water level usually has a greater effect on military mining than does the surface water. In strata, or by direct observation in wells, shafts, or in drill holes sunk for the purpose. It should also be noted that ground-water level has in many places a sufficient seasonal fluctuation to make it important to determine this for underground warfare. One of the most important services performed by Colonel David was the accurate determination on the British front of the ground-water level at different seasons of the year. By his advice, the British mines were located

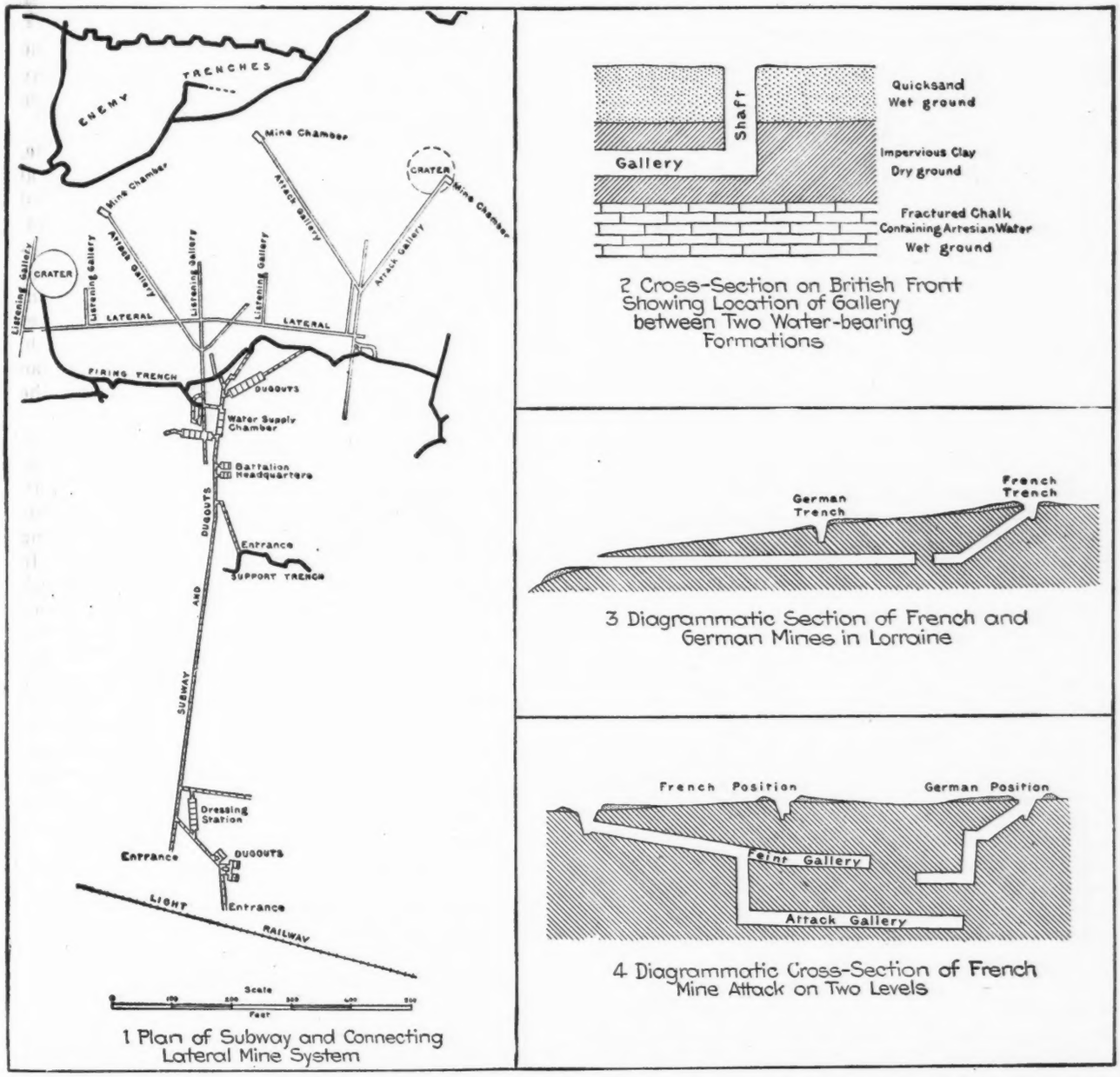



FIG. 2. (1) PLAN OF SUBWAY AND CONNECTING LATERAL MINE SYSTEM. (2) CROSS-SECTION OF BRITISH FRONT SHOWING SITUATION OF GALLERY BETWEEN TWO WATER BEARING FORMATIONS. (3) DIAGRAMMATIC SECTION OF FRENCH AND GERMAN MINES IN LORRAINE. (4) DIAGRAMMATIC CROSS-SECTION OF FRENCH MINE ATTACKS ON TWO LEVELS

general, military mines must be kept above the ground-water level. Exceptions, however, are found where natural drainage to the surface can be obtained through galleries, or where power pumps can be used. In any given province, the depth of the ground-water table usually varies between certain fairly definite limits. Information about it can be obtained by studying the distribution of springs and seepages, the sequence of above the seasonal high ground-water level of the spring mouths, whereas the Germans, who attempted to drive at a lower level, were flooded out of their workings.

The length of gallery required to reach the objective is, of course, one of the most important elements in the estimate of the situation. This requires an accurate map, showing position of the enemy's works, which is usually obtainable from airplane photographs. In rare

instances, the position of the objective may have to be located by triangulation from the trenches, using a theodolite with a periscopic attachment. Successful mine attacks have been made by the British, by galleries that have been driven for a distance of over 800 ft., and there are many from 500 to 600 ft. long. The average length of the attack galleries, between lines, is, however, less than 500 ft. Fig. 2 shows plan and cross-sections.

### Depth of Mining Operations

Mine attacks are usually made at the greatest depths which the physical conditions will permit. In general, the vertical zone of attack is limited at the top by the maximum depth of penetration by enemy's shells, say 10 to 30 ft., and at the bottom by the ground-water level. This rule has, however, exceptions. The tactical situation may demand an attack where physical conditions prevent sufficient depth for a safe overhead cover. In such case, steel I-beams should be used for caps, and all timbering made very heavy. The success of such shallow mining will, however, usually depend on its non-discovery by the enemy rather than on actual protection of the galleries against artillery fire.

In the absence of natural drainage, and where large power pumps can be used, it may be practicable to put the mine galleries below the ground-water level. In general, the best place for a mine system is at the ground-water level, which will give protection against counter-mines from below. Most of the British mining was at depths of from 20 to 100 ft., though the British made some attacks at as great a depth as 200 ft. The great system of mines at Messines Ridge averaged nearly 100 ft. in depth. In the Vosges, near St. Die, the French drove self-draining galleries in tough sandstone and conglomerate at depths of 200 ft.

It is evident that the choice between entries by shaft incline, or by gallery, will depend largely on the surface terrain. The French, however, made much use of a gently sloping gallery, instead of a shaft. The relative advantages and disadvantages of the different types of entry will be discussed below. Every mine should have at least two entries, spaced as far apart as conditions permit. This to provide for an emergency exit if one entry be destroyed by shell fire.

When the mine is opened up, a listening guard is established and the acoustical instruments are provided. This work will include the installation of the microphone, with a central listening station. A detail of soldiers trained in mine-rescue work is also made and provided with necessary equipment. As soon as possible an underground first-aid station is excavated.

Surveys of the mine workings must be started at the beginning, and the results kept platted on a map. If the enemy be countermining, the location of any sound, as determined with the geophone, is platted on a mine map, and a record made of the character of the sound. If the enemy be near at hand, preparations must be made for the rapid installation of mines or camouflets, including the estimates of the quantity of explosives needed to attain the desired results of destruction. If the mine to be exploded be a large one, a special chamber or chambers may have to be excavated.

Usually, a mine will not be exploded until the objective of the attack has been reached and all preparation for the advance by the infantry made. This grand attack may include the simultaneous explosion of many mines in separate chambers or galleries. At Messines Ridge, nineteen mines were exploded at one time, charged with a total of about 1,000,000 lb. of ammonal.

The French used gently sloping galleries as mine entries. This does not differ essentially from the British practice, except that the angle of slope is much less. Sloping galleries have the advantage of being easy to construct and afford good haulage and easy egress. Their disadvantage is that proper depth and sufficient overhead cover are attained only at some distance from the mouth. Moreover, a much greater part of the gallery is susceptible of destruction by artillery than is the case with the steeper inclines. Where it is necessary to attain depth quickly, as in the case of entries in the front line, or when topography demanded it, the French used inclines similar to those of the British.

The German mines usually began with an incline, which terminated in a chamber from which a vertical or nearly vertical shaft was sunk. The chamber served as a shelter for the man operating hoisting equipment. This form of entry has the advantage over the incline in permitting depth to be attained at greater speed. It is more difficult of defense than the incline, but can be used to advantage where wet ground has to be penetrated at considerable depth. For the reasons given above, it is obviously better than the use of shaft alone. Conditions permitting, the incline is probably the best form of mine entry.

Inclines are given a slope of from 15 to 45 deg., but for mine entries are usually at least 30 deg. The British used standard gallery frames, spaced on 3½-ft. centers and set at right angles to the slope. This gives more head room than needed, but saves the fitting or supplying of timbers of different dimensions. In the French practice, frames are often set vertical, for the reason that it can be done by less experienced men. As a general rule, sills are used only near the entrance, and here the frames are placed in contact, and, because of exposure to enemy fire, all timbering is of a more substantial character than at a lower level. If the formation is clay or other unconsolidated material, lagging is used for the walls of the incline, as well as for the roof, but in chalk and harder rocks only the roof is completely lined. Wooden steps are made in the inclines to give easy communication.

### Dimensions of Galleries

Mine galleries are classed as main or common galleries, which are used as haulageways, and branch galleries, used for attack, defense, or listening. The main galleries usually have a dimension of about 6½ x 3 ft. It has been shown by experience that except in extreme urgency it is not good practice to make the main galleries too small, for though they can be more quickly excavated than the large ones, and there is a saving in timber, they are a serious handicap in handling spoil, explosives, and other material, in such cramped quarters. In time of active underground warfare it may not be possible to make the large galleries, and headings are then driven of such dimensions as conditions permit, and later enlarged if extensively used. The branch galleries are of various sizes, varying from 4 x 3 ft. in cross-section to small holes excavated by men lying down, the latter, of course, made only in extreme emergency.

At first neither the British nor the French attempted to standardize the dimensions of their mine workings. As underground work developed on a large scale, it was

found that there was much loss of time due to this lack of standardization, and as a result standard sizes were fixed by regulation, for which timber was furnished.

In chalk, the timbering consists of sets spaced on 3- or 3½-ft. centers, and these are often placed without sills. In harder rock, wider spacing is used. The roof is usually lagged with plank, but the walls, where the rock is found, are without lining. If the rock be hard but shattered, they are lined with light sheeting. The sets are made of round or square timbers, with a diameter of about six inches. No notching is done, as it is claimed that this weakens the timber. The props are held in place by spreaders nailed on the caps or sills, of such length as to leave a 6-in. recess at both ends. Planks of 1 to 1½ in. are used for the roof, and in case of greatly shattered rock the same material may be used for the walls. Under other conditions, only light lining for the walls is necessary.

The light wooden frames with expanded metal cope made for reverting trenches have been found to be well adapted for light wall lining. It is needless to add that in mining hard and unbroken rocks the amount of timber is much less. When close to the enemy and a surprise attack is being carried on, screws instead of nails are used in underground work.

Galleries in clay or other loose material are usually completely timbered, though if the clay be compact it may not be necessary to line the floor. This timbering may consist of sets with plank lagging, or may be made only of planks. In the latter case, spreaders are used on the floor, and roof boards, similar to those of the caps and sills of sets. The French made some use of sets made of reinforced concrete, but generally only for entrances to dugouts in the rear positions. They are too heavy to transport into the mine workings at the front.

### Removal of Spoil

Much of the mining was done under conditions where the spoil was dragged to the mine entry in sand bags.[1] Wherever possible, however, small mine cars were used for this purpose. On account of the noise, the mine cars were often run on wooden tracks. In some instances the wheels were rubber-tired. All spoil was placed in sand bags at the face. Most of the hoisting in the British mining was done by hand, and much of it by simple windlass or even block pulley. The following data regarding speed of hoisting were obtained from the British: In a shaft, not over 35 ft. deep, one man with a 6-in. drum and 14-in. handle can hoist two bags of spoil in about half a minute. Two men with a 12-in. drum can hoist two bags at the rate of 80 to 100 ft. per minute. It has been found that a two-man windlass can be operated so as to hoist the spoil from galleries driven at an average of about 30 ft. a day, if the depth does not exceed 100 ft.

Small geared winches were used where the conditions permitted. These were used on inclines, with small cars running on light rails. The cars had flanged wheels running on about a 40-cm. track, and were built with a platform with a shelf at the lower end. The capacity of a two-man winch, geared 5 to 10, 10-in. drum, 14-in. handles and a car holding 24 bags at 80 ft. depth and 250 ft. haulage, was about 1,500 bags a day. This equipment would clear about 20 ft. of heading a day.

[1]Sand bags measure from 12 to 14 by 25 to 35 in. When filled with earth they weigh from 50 to 70 lb.

In many instances the only hoist equipment at hand was the simple block pulley. Experience has shown that two men with a block pulley can hoist an average of one sand bag every three minutes out of a 60-ft. shaft. This block pulley has the advantage of hoisting out of an incline, in that no special cover has to be provided for the men. To protect the men at the winch, a station was put in near the top of the incline, with at least 20 ft. of overhead cover. From the stations the bags are hauled to the surface with block pulleys. In their second-line positions the French made considerable use of belt conveyors for excavating spoil from dugouts. So far as known, these machines were not used in mining operations. Practically all of the spoil was carried from the mouth of the shaft or incline to the dump on men's backs. In exceptional cases small handcars were used. The difficulties of transporting and disposing of the spoil after it reached the surface often seriously interfered with the progress of mining.

As mining was possible only at the extreme front, where conditions for transport were at their worst, in general only light equipment could be used. Under normal front-line conditions, no equipment could be called for of which the unit pieces were over 80 lb. in weight, and which could not be handled by two men in the ordinary communicating trench. The problem of equipment was rendered more difficult by the fact that, in spite of limitations in weight and bulk, the front line was no place for the use of delicate machinery, and all equipment had to be of a substantial character.

### Light Picks and Shovels

Most of the mining of the British front was done with light picks and short-handled shovels. These were the tools with which the troops proved most efficient, because of their previous use of them in civil life. For the excavation of small galleries not large enough for these tools, special implements were provided that need not here be described.

As already noted, the spoil was put in sand bags at the face and transported to the shaft either on men's backs or on small mine cars which were run on wooden or iron tracks. Sand bags were furnished in large quantities, for they usually could not be used for rock transport more than five times.

The British made little use of power drills, because of the noise their use involved and because the rocks in their sections were not hard enough to warrant the difficulties of installation and maintenance. On the other hand, in many parts of the French front there were hard rocks with which rapid progress was not possible without power drills. The French used both electric and pneumatic drills. The latter were preferred because of the help given to ventilation. Many British officers held that if power drills were necessary, military mining would usually be impracticable, on account of the distance at which the operation could be heard. The French, on the other hand, held that if the enemy were near enough to hear the use of the pick they would know the locality of the mine, and then speed would be the controlling factor. Moreover, they also claimed that it is more difficult to locate the sound of the pneumatic drills than that of picking. Actual experience has shown that mining and countermining have been carried on where both combatants used air drills. It must be confessed, however, that these operations, so far as known, did not lead to important tactical results.

Where power drills are used, the compressor or electric motor must be placed as close at hand as conditions permit. This is to avoid long pipe lines or transmission lines, likely to be broken by shell fire. The French have operated air compressors within 800 ft. of the enemy's line. In other instances, compressed air has been transmitted for over 3,500 ft. within the zone of shell fire. It is needless to state that all power stations within the front-line zone were placed in dugouts or otherwise protected from shell fire.

Both the French and British made extensive use of hand drilling machines. The most important employed by the British was the boring machine operated by

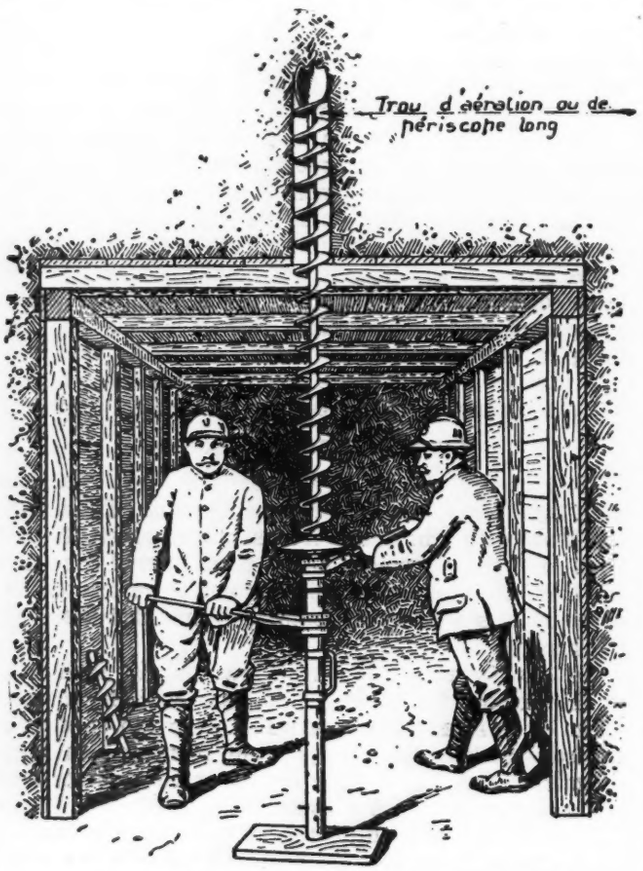



FIG. 3 FRENCH HAND BORING MACHINE

three men, which would drill a 6-in. vertical or horizontal hole for a distance of 300 ft. in chalk. It was, however, most generally used for holes less than 100 ft. in length. Its principal use was for boring of ventilating holes in the roofs of dugouts and sub ways (Fig. 3).

The British also had some light-weight power boring machines, operated by two men, with which ½-in. to 1-in. holes could be sunk in chalk to a depth of 80 ft. These were extensively employed by the British geologic officers to test underground conditions. Drilling parties commanded by geologic officers were kept in the field practically all the time, and in all over 1,500 holes were bored.

As but little British mining was done in rocks requiring blasting, no drilling equipment for this work was necessary. On the other hand, the French made much use of hand machines for drilling holes for blasting. For this they employed many of the standard types utilized in commercial work, and also had some specially designed for military purposes. The smaller of these were operated by one or two men. These machines and methods of operating are well illustrated in Fig. 1 and 3. They included some for drilling large holes used for ventilating and for operating periscopes.

Both the French and British experimented with tunneling machines designed for driving small galleries. Some of these appeared to have merit for certain classes of material, but so far as known none were employed at the front. The French made considerable use of small belt conveyors in positions back of the front.

The information at hand concerning types of equipment for pumping, ventilating, power, and other like purposes is far from being complete, and it will not, therefore, be desirable to attempt to list or describe the various machines used for these purposes. Suffice it to say that they were for the most part of the simplest type, and many were designed for hand operation. British pumping equipment varied from simple hand pumps to centrifugal pumps with a capacity of 1,000 to 4,000 gal. per hour, and with a lift of 30 to 150 ft. These latter were operated by 4-hp. motors. The ventilating apparatus varied from the simplest hand blowers long used in civil life, to hand- and power-operated fans and to air compressors. The French equipment was of the same general character.

### Rescue Appliances

As a result of the explosion of both friendly and enemy mines, the shattered underground works may be filled with gas, and cannot be safely entered except by men equipped with gas helmets; therefore, mine-rescue apparatus formed an essential part of the equipment for underground warfare. This equipment was chiefly of the standard type long used in commercial mining, and need not be here described.

Of listening devices the geophone, not known to many mining engineers, was of most assistance. This is a light portable instrument, consisting of two sound-magnifying or receiving disks, each of which is connected by tubes with the ears. In using this instrument, the receiving disks are moved on the ground until the sound is heard with equal intensity in both ears. The direction of the sound will then be at right angles to a line connecting the two disks, and its aximuth is determined by use of small compasses. Evidently, by determining the direction of the sound from two different points whose relative position is known, the source of the sound is located by the intersection of the two lines of direction.

## German Potash Production Growing

Figures published in Washington on Feb. 29 gave the German production of potash during January as 550,000 tons. This greatly increased output is ascribed to the improved industrial condition of the country and to the large numbers of returned prisoners of war which are now available. Before the Great War, however, the monthly production was about double this figure. Anthracite is urgently needed in the potash industry, and some arrangement may be made whereby American coal can be exchanged for the German product.

**Tin** production in the United States was about 50 tons in 1919, according to the U. S. Geological Survey, and came almost wholly from Alaska. The output in 1918 was 68 tons. These figures do not include the tin produced from foreign ore.

# Failure of Mine Timbers

## Conditions in Wet and Dry Mines—Influence of Ventilation and High Temperatures in Reducing Strength of Timbers—Structural Insufficiency—Causes Operating To Develop Weakness

BY GEORGE J. YOUNG
Written exclusively for *Engineering and Mining Journal*

IN MANY MINES the need for development of ore and the pressure brought to bear upon managers and superintendents to sustain dividends prevent careful consideration of the use of mine timber. Generally the most available material at hand is used, and it is left to the underground timber boss to make the best of the situation as it develops. It is surprising how well in some instances the timber boss handles his problem without the active assistance of the mining engineer whose time may be fully occupied in "nosing" out ore.

FAILURE OF STULLS IN A NARROW STOPE OF THE MOUNTAIN KING MINE, MERCED COUNTY, CAL. NOTE SILLS, STRINGERS AND SPRAGS

Economical utilization of timber is, however, one of the essential divisions of underground work, and with proper engineering attention the cost of timbering can be prevented from assuming a prohibitive proportion of the mining costs.

Mines where timber is used (and this includes almost every kind of mine) may be classed as wet mines and dry mines, as poorly ventilated and as adequately ventilated, as mines in which underground temperatures are normal, or almost so, and mines in which the temperatures are abnormal. As a rule, wet mines are harder upon timbers than dry mines. This is due to the fact that the ground is heavier in wet mines than in dry mines. Much water presupposes extensive fissuring and planes of movement, and where this is the case there is often the development of a gouge plane, either upon the foot wall, or upon the hanging, or both. The presence of a gouge is clear indication of past movement.

The opening up of such ground disturbs whatever equilibrium may have been established and again starts blocks of ground on the movement to adjust themselves to the new conditions. There are all degrees of ground movement under such circumstances. The more rapid the adjustment the greater the difficulty of support by timbers and the greater, also, is the need for the engineer to open up the ground in small parcels, so as to increase the time over which such adjustments will take place. A part of the difficulty of controlling such ground can, at least, be avoided or reduced by prompt and thorough drainage.

Stagnant air, such as may be present in dead ends or poorly ventilated drifts or other workings, quickly induces dry rot, with resultant weakening of the timber and failure in a short time. The effect of even a small current of air in prolonging the life of mine timbers is not perhaps appreciated as well as it should be. A constant movement of a hundred cubic feet per minute will be sufficient. Good ventilation, apart from its other desirable features, will insure the minimum amount of dry rot and reduce the number of failures of timbers from this cause.

Temperature is another factor, though its effects are, however, not conspicuously present in many mines. High temperatures favor increased bacterial growth, and mine timbers are favorable places, under such circumstances, for the growth of a number of wood-destroying bacteria. Excessive temperatures can be controlled to some extent by increasing the volume of the ventilating current, either by efficient splitting and upcasts of good size or by supplemental power ventilation. Timber preservatives, of course, can be used to retard and even prevent dry rot. Their employment is advisable where workings are to be maintained in an accessible condition for time intervals exceeding eighteen months and where temperature and ventilation are adverse. It is surprising, however, that there is not more extensive use of the simpler methods of timber preservation.

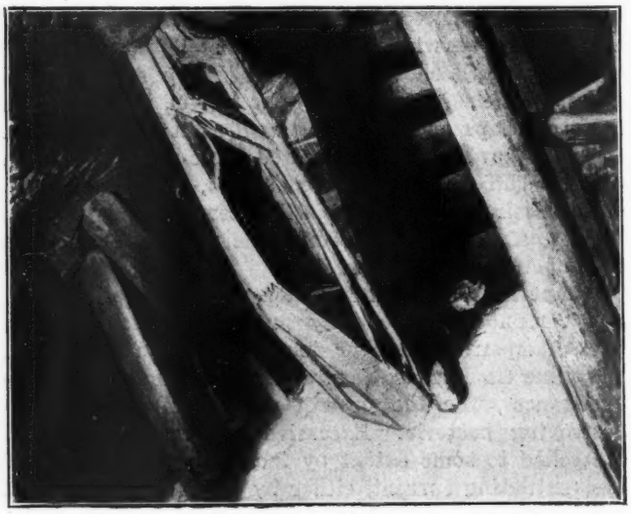
Failure of particular timbers by breaking or the general failure of timbers in a given part of a mine may be due to too excessive ground pressure either of a widespread nature or localized in a part of a stope. Prolonging the life of timbers under such circumstances can be anticipated by the timberman by the systematic use of head boards, easing sets in the case of shaft structures, or the use of easing pegs in the case of drift sets in heavy ground. After failure has begun to take place, the alternatives open to the timber boss are to decrease the pressure coming upon individual timbers by erecting additional timbers, by timber cribs, by timber and rock-filled cribs, or, a more heroic and expensive remedy, by filling the stope with waste.

Failure of timbers may be due to structural insufficiency. This may be exemplified by the failure of a square set stope where the direction of the pressure produces jack-knifing of the sets. Similar failure may take place from the faulty design of joints. In cases of this kind the engineer can be of considerable assistance to the timber boss by examining the particular failures and pointing out better designs to meet the conditions.

In the two illustrations accompanying this article, the first shows the condition of timbering in a narrow stope of the Mountain King mine, Merced County, Cal. This mine is moderately wet. The stope shown is about six feet wide. It is timbered with stulls, stringers and sills. General failure of the stope is shown, produced partly by the weakening of the timbers due to dry rot and partly by the gradual increase of the weight of the ground. In a part of the stope the failure was more pronounced than indicated in the photo.

The second illustration is a photograph taken in the Tonopah Belmont mine, Tonopah, Nev. It represents the condition in an open stope contiguous to a drift which is in use for transportation and access to other parts of the mine.

The principal stopes and workings in the Belmont



FAILURE OF STULL TIMBERS BY LONGITUDINAL SPLITTING. TONOPAH BELMONT MINE

mine are dry, and as a consequence ground pressures are not excessive, nor does the hanging wall develop pressure as a whole, but rather only on such areas as tend to readjust themselves locally. This local pressure is manifested by the failure of a moderate number of contiguous stulls. It is seldom that failure takes place over a wide area.

Where local pressures begin to show by the head boards on the tops of the stulls crushing down, timber cribs are built up to take the pressure and prevent a local collapse of the hanging wall, which might block the drift. The head board is an excellent indicator of the growth of this local pressure. Where the stulls fail, they break across, or, as is more commonly the case, they split longitudinally first, and then, as the pressure increases, breakage of the timber finally ensues. Longitudinal splitting may be due to the hanging wall riding the timber in a direction at an angle to the line of the stull, or to the difficulty of securing an even bearing for the foot of the stull. It is probable that both of these causes explain the breakage in the manner shown. It would seem that by pointing the lower end of the stull, leaving, however, the end like a truncated cone, the life of the stull could be increased. The brooming out of the lower end would be an additional indicator of excessive pressure. This practice is not unusual in the case of props used in coal mines, but it is seldom or never to be observed in metal mines.

# Conditions on the Rand

## Serious Diminution in Commercially Reliable Reserves —High Costs, Taxes, and Miners' Compensation Law Increase Difficulties of Operation

BY E. M. WESTON

Written exclusively for *Engineering and Mining Journal*

THE Union Government considers that it has a large asset in its shares of the profits to be earned by the various companies to which it leases ground. Sir Robert Kotze estimates the aggregate from seven leases at £38,520,000. This, of course, will take over twenty years to realize. The leases are:

| | Claim Area | Government Shares of Profits |
|---|---|---|
| Breakpan Mines | 1812 | £2,600,000 |
| Government Areas | 2633 | 18,400,000 |
| Modderfontein East, Ltd. | 651 | 250,000 |
| New State Area | 2055 | 8,400,000 |
| Spring Mines | 2236 | 5,600,000 |
| West Springs | 2236 | 6,200,000 |
| Cragie Mines | 31 | 5,000 |

There is still to be leased a large area of ground that is probably of great potential value, but the government calls for tenders only when it thinks capital is available from several sources, insuring competition. The case of the New State Areas, in which there was a bid amounting probably, with taxation, to the government taking 70 per cent of the profits, was exceptional.

The natural exhaustion of a number of the older producers is rapidly approaching. Three mines already closed are the Durban Roodeport, the Glencairn, and the Ginsberg. The following mines have strictly limited lives: The Robinson mine has only 322,000 tons of rich ore in reserve, with an uncertain amount of payable main reef; Ferreira Deep has about one million tons in ore reserves, with a proportion of ore available from reclamation; Village Main Reef has an uncertain life of one and one-half to two and one-half years; City and Suburban, with a possible life of three or four years; Wolhuter has a possible life of about four years; New Heriot is working at a loss, with possible life of three or four years; Geldenhuis Reef is of strictly limited life; Primrose is reclaiming old workings and has a possible life of one and one-half to three years; New Kleinfontein is working at a loss; New Unified has a life of two to three years, and Bantjes Mine closed down owing to high working cost and poor results.

This exhaustion of outcrop mines was only to be expected, it being a matter of surprise that they have lasted so long. Their stoppage will cause great local distress, and the practical ruin of several reef townships; but a greater menace to the industry is the fact that, including some of the mines mentioned, no less than sixteen mines, employing 5,545 white employees, are working at a loss. The closing down of several of these mines seems certain. They include mines such as the Robinson Deep, Simmer Deep, and Jupiter. The most immediate cause is no doubt shortage of native labor. Other causes of shortage have been the war in East Africa, the increase in manufacturing and agriculture locally, and the greater activity in diamond mining at Kimberley and other diamond-bearing areas.

Last year the dividend-paying mines were menaced with a new danger, as, besides the Union Government taxes and war levies, the Provincial (State) Council of the Transvaal levied a tax on dividends. Another heavy burden has just been thrown on the mines in the form of a revised and retroactive Phthisis Compensation bill.

# James Gayley

JAMES GAYLEY, first vice-president of the United States Steel Corporation from 1901 to 1909, and distinguished among steel men for his knowledge of metallurgy, died Feb. 25 after an illness of several weeks at New York City. He was born at Lockhaven, Pa., Oct. 11, 1855. A little later the family removed to West Nottingham, Md., where his boyhood was spent, and where he attended the West Nottingham Academy. From the West Nottingham Academy he went to Lafayette College, taking a course in the department of mining engineering, and being graduated in 1876.

Mr. Gayley began his professional career as a chemist of the Crane Iron Co., Catasauqua, Pa. Three years later he went to the Missouri Furnace Co., of St. Louis, in the capacity of superintendent, resigning to assume the management of the blast furnace of the E. & G. Brooke Iron Co., Birdsboro, Pa. In 1885 he was put in charge of the furnaces of the Edgar Thomson Steel Works at Braddock, Pa., which were owned by Carnegie Brothers & Co., Ltd., and which subsequently became the Carnegie Steel Co. There he was largely instrumental in bringing American blast-furnace practice up to a plane never before attained. His record with the Edgar Thomson furnaces, everything considered, has not been surpassed for fuel economy, output in proportion to cubic capacity of stock, and of durability of linings.

JAMES GAYLEY

Mr. Gayley's next promotion was to the post of manager of the entire Edgar Thomson plant, and in 1897 (later) he became a managing director of the Carnegie Steel Co. While at the Edgar Thomson works he was the first to install charging bins for the raw materials at the blast furnaces and he also installed the first compound condensing engine for supplying air blast to a blast furnace. At the ore docks of the Carnegie Steel Co., Conneaut, Ohio, on Lake Erie, he installed the first mechanical ore unloader and designed a vessel construction adapted to the use of such unloaders.

During Mr. Gayley's brilliant career as an iron and steel maker, he made many important contributions to the progress of metallurgical industry. Among his valuable inventions may be mentioned the bronze cooling plate for blast-furnace walls; the auxiliary stand for holding the ladle while the bessemer heat is being poured, supplementing the crane and enabling two vessels to do the work for which four were formerly required, and the "dry-air blast." The last-named invention is probably the most important since Neilson's application of the hot blast in its relation to the reduction of iron ores, but its usefulness is not restricted to blast-furnace practice. One of the chief causes of variations in the working of a blast furnace and of inequality in its product is found in the greater or less percentage of moisture in the blast, but such vicissitudes of furnace working were accepted as inevitable until Mr. Gayley conceived the idea of drying the air by taking the water out of it, and thus maintaining through all seasons and all changes of weather the excellent conditions of furnace operation experienced when the weather is so cold as to reduce the humidity of the air to zero. This he accomplished by the simple and obvious expedient of drying the air by refrigeration, the dried air current then passing to the hot-blast stoves, and from them into the furnace. The result is an important fuel economy, with a previously unobtainable uniformity of furnace product. The gain is about 20 per cent.

Mr. Gayley was probably the most highly qualified technical expert among those prominent in the steel industry. When the great merger which created the United States Steel Corporation was formed in 1901, he was made first vice-president, and carried into the larger organization not only an invaluable experience but the confidence and influence of Andrew Carnegie and the men who then associated themselves with the business.

Mr. Gayley was a member of the American Institute of Mining and Metallurgical Engineers, of which he served as president during 1904-1906, and he was also a member of the American Iron and Steel Institute, and the (British) Iron and Steel Institute. His contributions to technical literature have been numerous and important, and are found chiefly in the transactions of the American Institute of Mining and Metallurgical Engineers, the (British) Iron and Steel Institute, and of other American and foreign societies of which he was a prominent and honored member. Among his contributions to transactions of the American Institute of Mining and Metallurgical Engineers are "A Chilled Blast Furnace Hearth"; "Development of American Blast Furnace, With Special References to Large Yields"; "The Preservation of the Hearth and Bosh Walls of the Blast Furnace," and "Application of Dry-Air Blast to the Manufacture of Iron."

In 1912 the University of Pennsylvania and Lehigh University conferred upon James Gayley the honorary degree of doctor of science. He was awarded the Elliott Cresson Medal by the Franklin Institute of Philadelphia in 1906 and the Perkin Medal in 1913. In 1902 Mr. Gayley presented to Lafayette College the building known as Gayley Hall, for the study of chemistry and metallurgy.

# CONSULTATION

## Premium on Gold in London

"We have noticed through the newspapers for the past month that gold bullion sells in London at 121s. to 123s. per ounce. One of your recent issues practically confirmed the above. Please advise us how we might proceed to secure this increased price in London for gold bullion. Who purchases this bullion, and who in London might be able to represent us in disposing of gold bullion for our account at this premium price? Your reply will be appreciated."

It is our belief that the premium reported to be paid on gold in London is being paid to producers of gold in the British possessions, and is being paid in exchange which is already at a discount as compared to United States gold. The fall in sterling exchange has just about discounted the market value of gold in London. Therefore, we do not see how you could hope to gain any profit by selling your gold bullion in the London market.

In *Engineering and Mining Journal* dated Nov. 8-15, page 752, we published an editorial on the subject "The Gold-Mining Problem," and in the issue dated Oct. 18 there appeared an article on the subject "The Gold Situation," by John Clausen. These articles may possibly be of interest to you.

## Inflated Currency and High Prices

"You have stated that the present high prices are owing to inflated currency in this country as well as everywhere else. What ground have you for this statement? If gold cannot be obtained for Federal bank notes, how do you account for the large export of gold last year? What has caused the advance in silver from 40c. in 1896 to $1.35 at the present time? I think also you have stated that the United States mints no longer exchange minted gold for the equivalent in gold bars. Where did you get this idea? The Federal bank note issue now stands at about 40c. to 45c. in gold back of each $1 outstanding. While this might be considered inflation, it is certainly not great inflation.

"While you refuse to admit the depreciation in the gold dollar to about 40c. in buying power, we have the fact before us, as shown by most metal prices (excepting copper, pyrite, and probably some others), that cotton and cotton goods, sugar, corn, wheat, flour, lumber, bricks, and other commodities are all selling at from three to five times prices of 1880 to 1900."

That the high prices are largely due to inflated currency you will find stated almost daily in the papers, on the authority of bankers and statesmen. It is true that *Engineering and Mining Journal* was among the first to point this out, but it is now widely acknowledged.

The export of gold is handled by bankers to adjust trade balances. The foreign bankers will not accept our money, and these adjustments are necessarily made in gold. This does not mean, however, that the bankers will pay out gold to adjust domestic business, whether large or small.

The advance of silver which you speak of is simply due to the law of supply and demand.

You say "'also you have stated that the United States mints no longer exchange minted gold for the equivalent in gold bars. Where did you get this idea?" We have not so stated—it is not true.

You state "While you refuse to admit the depreciation in the gold dollar to about 40c. buying power" . . . . You are under a misapprehension. We do not refuse to admit this—in fact we agree with you entirely; it is a self-evident proposition concerning which there can be no difference of opinion.

Regarding the possibility of obtaining gold from the banks in the United States, some banks, since Christmas, will pay out a small amount; others will not pay any at all. No bank will pay out more than a small amount, for the very good reason that it does not have it.

## Diesel Engines in Mining

"Please give me a list of manufacturers of Diesel engines, and a list of mining companies that are using Diesel engines. Also, I would appreciate having you refer me to any literature on the use of the Diesel engine in connection with mining operations, and I would like to know why Diesel engines have given trouble in some cases."

Following is a list of manufacturers of Diesel engines: Allis-Chalmers Manufacturing Co., Milwaukee, Wis.; Winton Engine Works, Cleveland, Ohio; Buckeye Machine Co., Lima, Ohio; Busch-Sulzer Brothers' Diesel Engine Co., St. Louis, Mo.; McEwen Brothers, Wellsville, N. Y.; MacIntosh & Seymour Corporation, Auburn, N. Y.; Midwest Engine Co., Indianapolis, Ind.; National Transit Pump & Machine Co., Oil City, Pa.; Nordberg Manufacturing Co., Milwaukee, Wis.; Worthington Pump & Machinery Corporation, New York, N. Y.; Fairbanks, Morse & Co., Chicago, Ill.; De La Vergne Machine Co., New York, N. Y.; Chicago Pneumatic Tool Co., Chicago, Ill.; Snow Engine Co., Buffalo, N. Y.; General Electric Co., Schenectady, N. Y.

The following companies are users of the Diesel engine: Copper Creek Mining Co., Copper Creek, Ariz.; Calumet & Jerome Copper Co., Jerome, Ariz.; Mascot Copper Co., Dos Cabezos, Cochise County, Ariz.; Arizona Hercules Co., Ray, Ariz.; Eighty-Five Mining Co., Lordsburg, N. M.; Mogollon Mines Co., Mogollon, N. M.; Socorro Mining & Milling Co., Mogollon, N. M.; Empire Zinc Co., Hanover, N. M.; Phelps Dodge Corporation. Morenci, Ariz.; Matahambre Mines, Santa Lucia, Cuba.

An article in *Engineering and Mining Journal* for Sept. 20, 1919, on the subject "The Diesel Engine in the Southwest," gives an excellent idea of the field of these engines. Also, a book on the subject "Oil Engines," by Lacey H. Morrison, has been published recently.

Our impression is that one of the principal reasons for trouble encountered with Diesel engines is that they have been often operated by untrained men.

"Would be pleased to receive the extreme lowest and the extreme highest quotations within the last fifty years for pig lead, and the respective dates of these quotations."

The highest quotation for pig lead during the last fifty years was on June 12 and 13, 1917, when the quotation was 11c. to 12c. per lb., both New York and St. Louis.

The lowest quotation on record, within the time limit mentioned, was on Aug. 29, 1896, when the metal was quoted at 2.45c. St. Louis and 2.60c. New York.

# THE PETROLEUM INDUSTRY

## Subsurface Correlations in Oil Prospecting

By S. S. Langley
Written exclusively for *Engineering and Mining Journal*

THE southwest side of the Midway oil field, in the San Joaquin Valley, California, shows a sharp line of demarkation between producing and dry holes. This is illustrated in Fig. 1, which is a map of a part of the field. Production is obtained on a monocline, the strike of which is northwest-southeast. The monocline lies on the northeastern slope of the Temblor Range. The general northwest-southeast trend of this fold is typical of the west side of the San Joaquin Valley, and the strike is so uniform in all folds that a line drawn from the southeast to the northwest corner of any township within the field will pass through the properties of greatest production.

In contrast to the policy of the far-sighted operator, there are today some who do not recognize the structural conditions which are known to prevail in this field. This is proved by their attempts to secure production by drilling in the area beyond the southwestern limits of the Midway monocline. Fig. 2 is an enlarged map of the property marked "A" in Fig. 1. Wells 5, 1, and 4 are small producers. Wells 2 and 3 were drilled and abandoned because of no production. Supplied with this knowledge and with the logs of all the other wells, also with a peg model of that particular part of the field, the owner of "A" decided to drill No. 6.

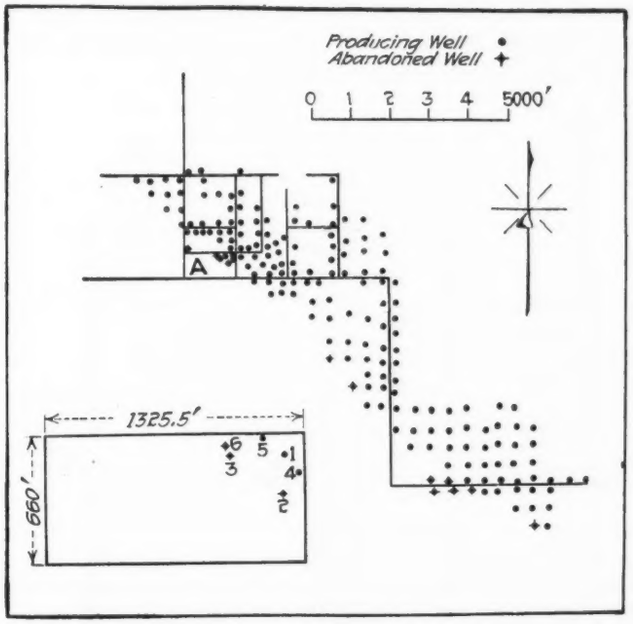



FIG. 1. LARGE FIGURE REPRESENTS WELLS IN MIDWAY OIL FIELD. FIG. 2. ENLARGED PORTION OF AREA MARKED "A" IN FIG. 1

Fig. 3 shows a cross-section through wells 5 and 4, with No. 1 projected upon it. Had there been no wells drilled, other than these, a study of this cross-section should have made anyone cautious. An examination of the wells shows a total lack of conformity of structure. Well 1 shows brown shale at 270 ft., and brown shale normally lies below the upper zone of production. Well 4 shows an oil horizon above the brown shale and a shell stratum above the first oil sand. Well 5 has brown shale above the first oil sand and shell between the first and second oil sands. Fig. 4 illustrates the lack of conformity between wells 4 and 2, as also between wells 5 and 3. In spite of what was shown by these cross-sections, well 6 was drilled, and the log of the well is shown in Fig. 5. Attention is called to the fact that well 6 is only 30 ft. from a former abandonment, well 3.

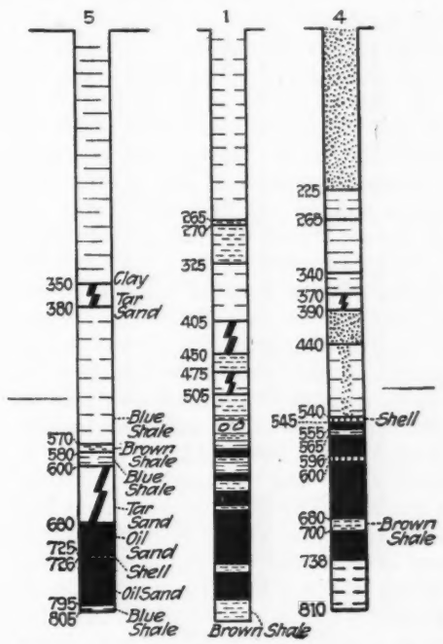



FIG. 3. CROSS-SECTION OF WELLS NOS. 5 AND 4 WITH NO. 1 WELL PROJECTED IN THE SAME PLANE

The only similarity in the logs of wells 6 and 3 is the occurrence of two tar sands between the depths of 250 and 400 ft., and both well 6 and well 2 show brown shale between the two upper tar sands. The three wells are alike in the total absence of oil sands.

The question may be asked, "What is the need of correlation in a case such as has been described?" It was totally unnecessary to make any cross-sections; a trip through the field or an examination of a field map would have been proof enough that No. 6 would be a dry hole. In the early development, before the productive area had been defined, any one of these cross-sections would have been of value. If Nos. 4 and 2 (Fig. 4)

had been the only development, their correlation would have shown why No. 2 was dry, and that it would have been useless to hope for production in the area to the southwest.

If there were no surface exposure to indicate the structure, a correlation of Nos. 4 and 2 would have

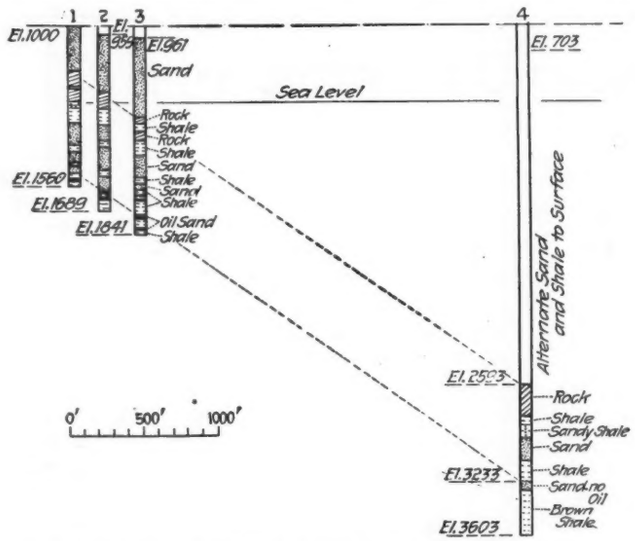



FIG. 6. CROSS-SECTION SHOWING OIL WELLS IN STEEPLY PITCHING STRATA

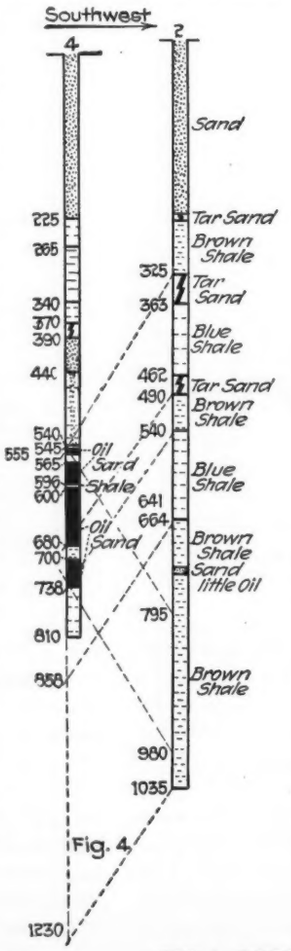
shown that the brown shale at 490 to 540 ft. in No. 2 was pinching out, to be replaced by a productive sand at 700 to 738 ft. in No. 4. The shale, lying between the tar sands at 363 to 462 ft. in No. 2, is almost completely missing in the correlative depth of 545 to 680 ft. in No. 4. Here is the evidence that the productive sands of No. 4 are laid down upon a steeply pitching shale, and, in passing to the southwest, the productive sands pinch out, being replaced by shale. To merely know that No. 2 is dry does not define the surrounding possibilities. If No. 2 had been drilled to a depth of only 641 ft., as was No. 3, and the correlation had shown the structure to pitch downward from No. 4, instead of from No. 2, production might be expected in the zone between 795 and 980 ft. in No. 2.

The log of a dry hole can teach as much as that of a gusher. The horizontal distance between a proposed well and a producer is too often given more consideration than the relative elevations of the oil sand in the producer and the proposed location. The distance along the strike of a persistent anticline is of little importance as compared to the distance down either flank. This is true in proportion to the steepness of the dip, and is illustrated by Figs. 6 and 7. The comparative horizontal distances are shown to be in both cases illustrated as follows:

| | Feet |
|---|---|
| Fig. 6 horizontal distance between wells Nos. 3 and 4 | 2,560 |
| Fig. 6 vertical distance between oil sand of 3 and barren sand of 4 | 1,800 |
| Fig. 7 horizontal distance between wells Nos. 10 and 36 | 3,319 |
| Fig. 7 vertical distance between oil sand of 10 and 36 | 320 |

The wells in Fig. 7 are on a long, gently dipping fold, with production shown over a horizontal distance of at least 3,310 ft. In Fig. 6 the production lies on a steeply pitching fold, and somewhere within a distance of 2,560 ft. the sand becomes barren. Picture the condition if the sands represented in Fig. 7 were folded downward at the same angle as those in Fig. 6. In order to reach the productive sands at a depth of 1,966 ft. in No. 36, this well would have to be at the location of No. 2. Increasing the dip of the sands from that of Fig. 7 to that of Fig. 6 would shorten the horizontal distance from 3,310 to 510 ft., or more than half a mile. Had wells 1, 2 and 3 encountered their productive sands at a depth as great as 3,000 ft., and a correlation showed that these sands would lie only two or three hundred feet deeper, as at the location of No. 4, there would have been every reason to believe that No. 4 would also obtain production.

Fig. 8 is a cross-section through wells 1, 3, and 4, shown on the accompanying field map. As most of the wells on this property are producing only from the first oil sand, the deeper wells, such as Nos. 1 and 4, carry two water-strings of casing. It will be noticed that well 4 has a water-bearing sand immediately below the first oil sand. The water-bearing sand prevents the production from all sands in any one well. Wells 1 and 4 had been completed, and, to determine the points of shut-off and the depth of encountering productive sands in well 3, a cross-section was prepared in the following manner: The graphic logs of wells 1 and 4 were pasted to a sheet of opaque paper so that the space between them on the blue print would be white after exposure and washing, yet the logs would print. Due regard was given to their relative altitudes.



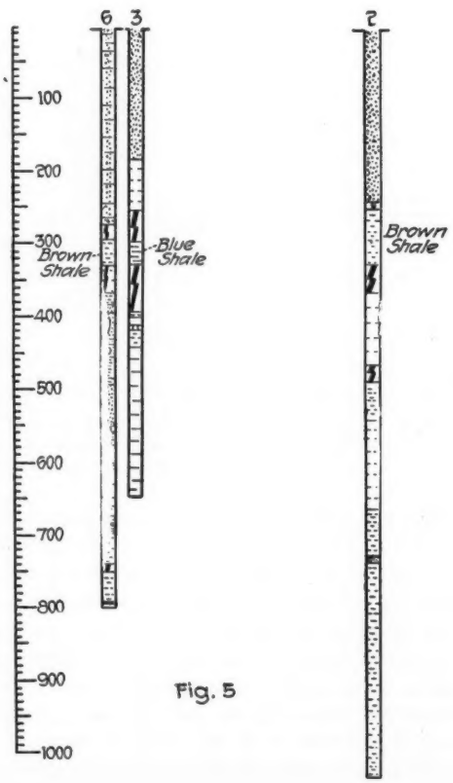




FIG. 4. LOGS OF WELLS NOS. 4 AND 2
FIG. 5. LOGS OF WELLS NOS. 6, 3 AND 2

Wells 1 and 4 were then correlated as shown by the lines marked A-A. The log of well 3 was made as the drilling progressed. The first non-conformity in No. 3 appeared at a depth of 362 ft., where a shell formation should have been found. At 403 ft. the shell was encountered, and the correlation altered to follow the line "D." This correlation checked at 657 ft. where the first was not safe to accept D as the correlation. To have done so would have assumed a total distance between the oil sands in No. 3 of 297 ft. This might be the condition, but as there are no water-bearing sands between the lower oil sands and the shale break above it, there is no need to carry the second water string to the lower part of the shale. Acting on this, the 8¼-in. casing was

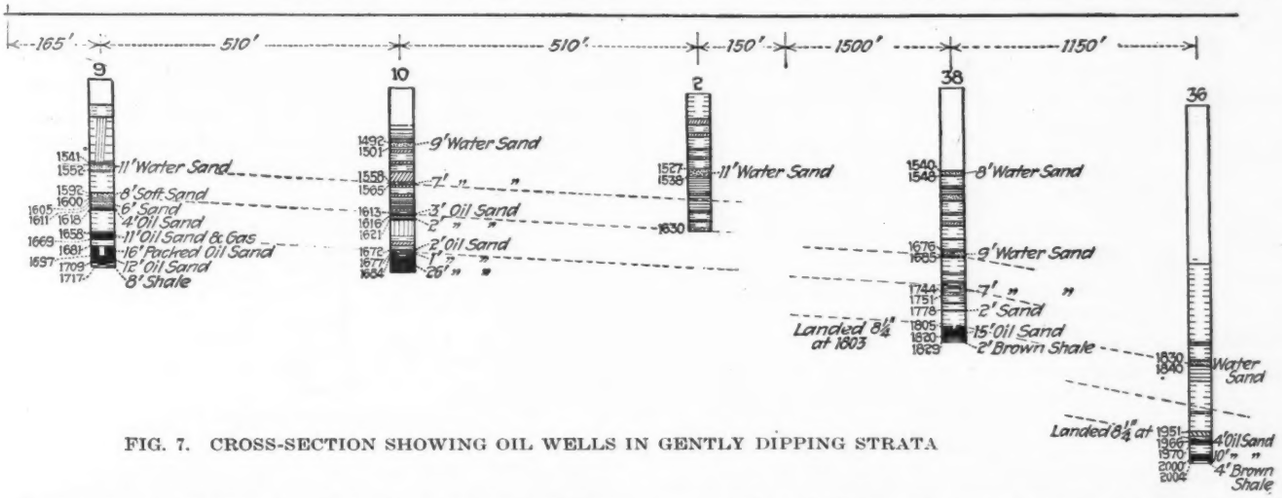



FIG. 7. CROSS-SECTION SHOWING OIL WELLS IN GENTLY DIPPING STRATA

oil sand was penetrated. The 10-in. casing had been cemented at 650 ft. The water sand lying under the first oil sand in No. 4 at 670 to 680 ft. also checked in position in No. 3. The distance between the top of the oil sand and the top of the water sand is 65 ft. in well 4 and 58 ft. in well 3. The correlative shell stratum below the sand was encountered at 720 ft. in No. 3, but cemented at 914 ft. The completed log shows that D was not the correct correlation, and that the non-conformity in No. 3 between the depth of 362 and 657 ft. was counterbalanced by a second non-conformity between 715 and 970 ft. The original correlation AA, as defined by the structure in wells 1 and 4, would have correctly determined the shut-off points in No. 3.

FORM FOR RECORDING DRILLING DATA

Well No.
Lease
Division Cable or Rotary Tools Date

| Tour No. 1 | | | Tour No. 2 | | | Tour No. 3 | | |
|---|---|---|---|---|---|---|---|---|
| From | To | Formation | From | To | Formation | From | To | Formation |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |

| Casing | Size | Make | Wgt. | Jnts. | Feet | Casing | Size | Make | Wgt. | Jnts. | Feet | Casing | Size | Make | Wgt. | Jnts. | Feet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| In beginning of tour... | | | | | | In beginning of tour... | | | | | | In beginning of tour... | | | | | |
| Put in during tour..... | | | | | | Put in during tour..... | | | | | | Put in during tour..... | | | | | |
| Taken out during tour | | | | | | Taken out during tour | | | | | | Taken out during tour | | | | | |
| Total in end of tour.... | | | | | | Total in end of tour.... | | | | | | Total in end of tour.... | | | | | |

Remarks

Driller .....
Checked..... } Lease Foreman.....

Remarks

Driller.....
Checked..... } Lease Foreman.....

Remarks

Driller.....
Checked..... } Lease Foreman.....

where a sandy shale is logged in No. 4, there appeared a shell stratum with streaks of sand. When the shale was encountered in well 3 at 844 ft. it was a question as to whether the correlation was that as shown by C or D in the figure. Because the total distances between the bottom of the first and the top of the second oil sands, in Nos. 1 and 4, are 292 ft. and 315 ft. respectively, it

A great many of the smaller properties in California fields have little or no data upon the mechanical or geological conditions of their wells. This is due in a great measure to the fact that these properties were drilled during the "boom," and the owners were not as much interested in the life of their holdings as in the speculative value of their stocks. As a result of this

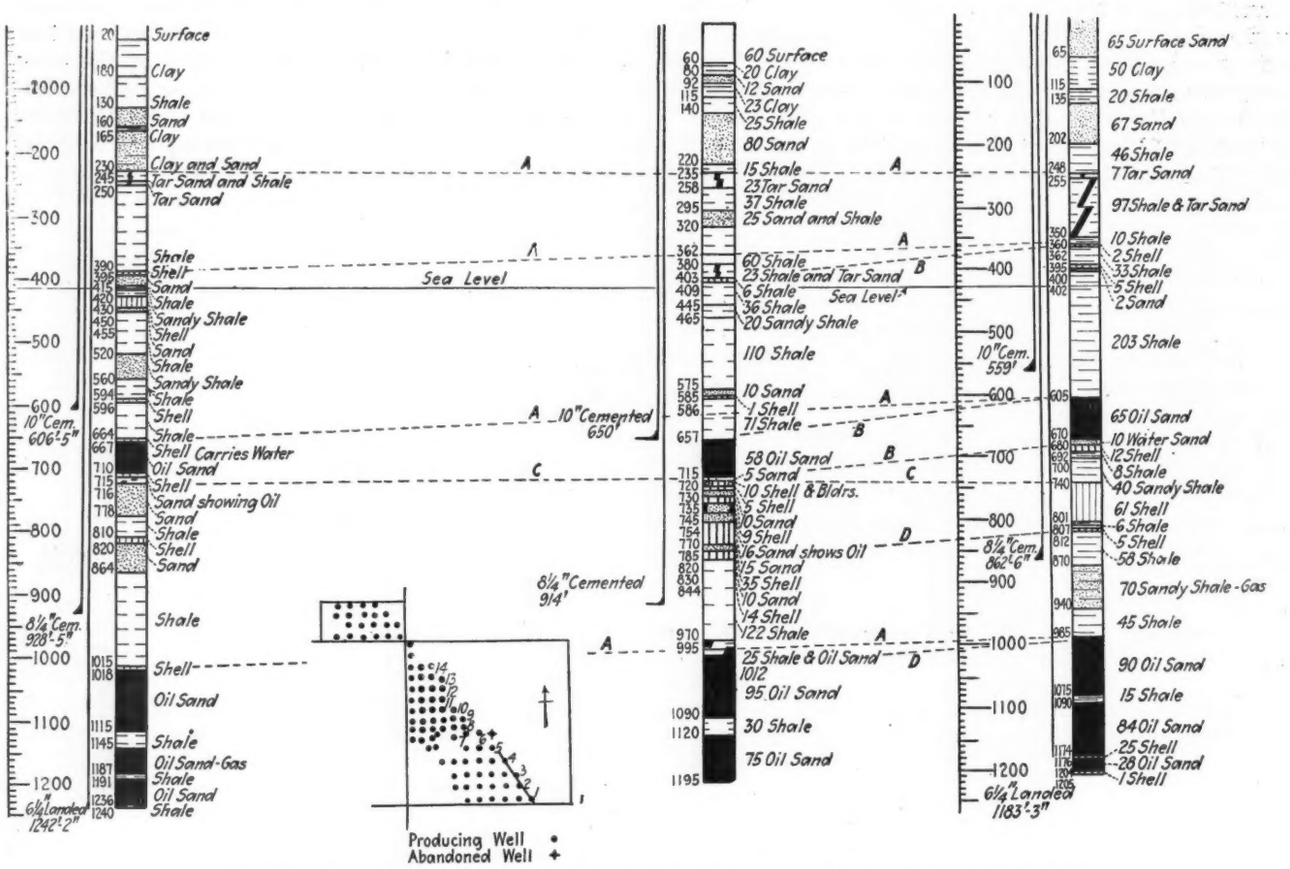



FIG. 8. CROSS-SECTION OF WELLS NOS. 1, 3 AND 4 OF ACCOMPANYING FIELD MAP

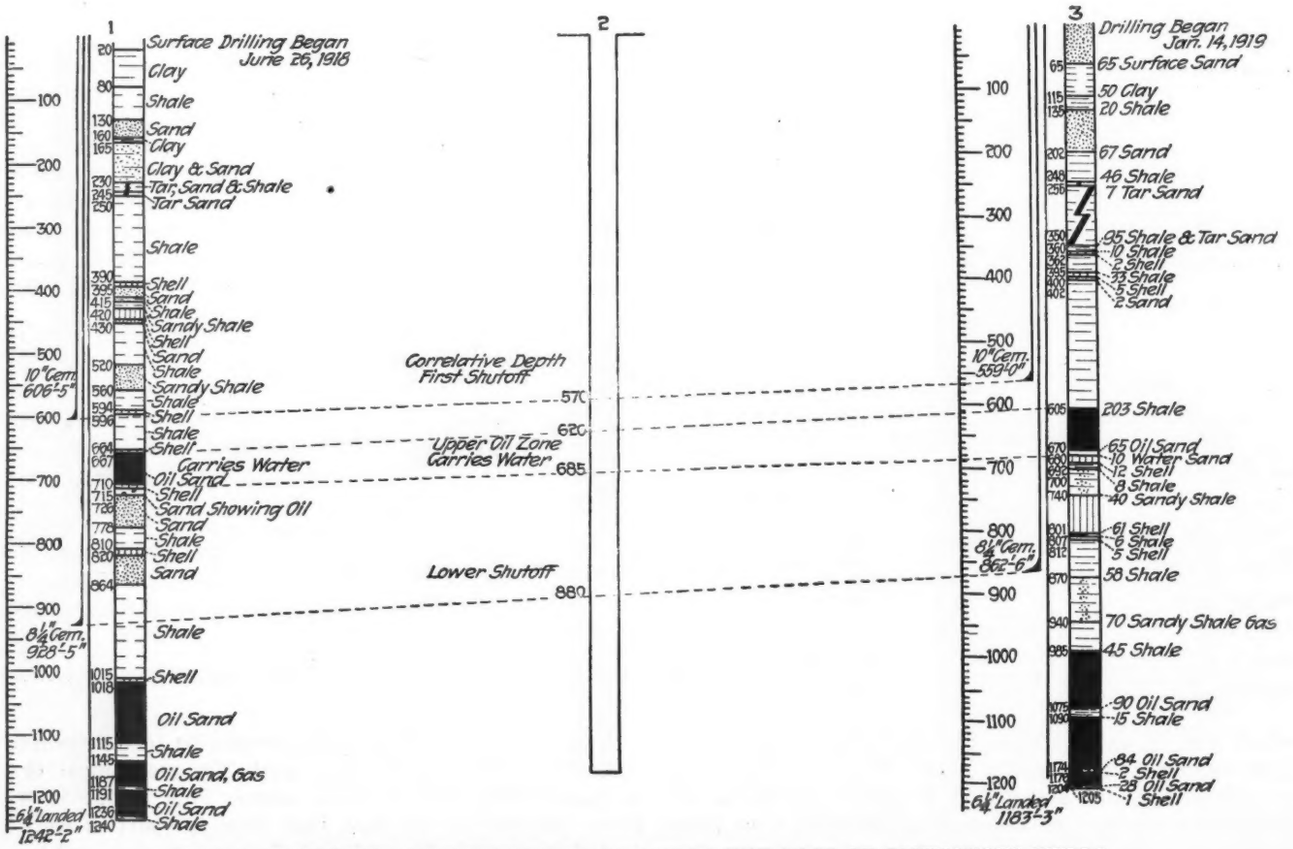



FIG. 9. SUPPLYING A MISSING WELL LOG FROM THE LOGS OF CONTIGUOUS WELLS

condition, many of the small properties have been sold to the large companies. The new owners have the funds and can afford to do the repair work necessary to put the property on a paying basis. Because the operators gladly exchange information, and the data of the State Mining Bureau is available, it is possible to work out the geological conditions by subsurface correlations.

Fig. 9 illustrates what can be accomplished by co-operation among the operators of neighboring properties. The three wells shown in the figure are old producers, and each is owned by a different company. The owners of wells 1 and 3 have complete drilling records of these wells, but the owner of No. 2 has no records as to casing or location of oil or water sands. Recently the production of well 2 began to show a large percentage of water. The owners of wells 1 and 3 were not only willing but anxious for their own protection to do all in their power to learn why No. 2 had increased its water production. The cross-section shown in Fig. 9 was made; the structure in wells 1 and 3 and also their mechanical condition could be shown. As the top oil sand in No. 1 and the sand at 670 ft. in well 3 are logged as water bearing, the inference was that the shut-off in well 2 had failed, thus allowing the water to pass to the productive horizon. The use of a cross-section determined the source of the water, and it became a mechanical problem to remedy the trouble.

An old field frequently gives production from two or more zones. The situation may develop where an operator who is producing from the bottom zone exhausts that zone. Unless the upper horizon can be drawn upon, the wells must be abandoned. If the drilling record is complete, the situation of the upper oil sands will be known and can be tested before the wells are abandoned. Should the owner lack complete drilling records, those of surrounding properties can be used to make up cross-sections, which will define the depths of the upper productive sands.

## Mining Conditions in Ecuador

BY GEORGE M. CHEVEY

The only district in all of Ecuador in which mining operations are being actively carried on is that of Zaruma, in the Province of El Oro. Here gold mining is done only by the South American Development Co. at its Portovelo mines. Total production during 1919 was approximately $500,000, considerably less than that of 1918, $700,000.

During the first part of 1919 the company's new metallurgical plant was put into successful operation. The mill is of 250 tons' capacity and employs the continuous counter-current decantation system. Work on the San Antonio manganese property, opened near Quito during war times, was suspended owing to the curtailed demand and the heavy transportation charges.

The oil fields at Santa Elena continue to produce a small amount of oil, sufficient for local consumption. A little drilling has been done near Salinas and at Ancon, a few miles southwest. Oil developments are also in progress near Manta.

**Roasting Zinc Ores in Belgium** is done in hand-raked furnaces, only two attempts having been made to depart from this rule. At one plant five Spirlet furnaces have been installed and at another plant a modified Hegeler is now under construction.

## Oil Near Thermopolis, Wyo.

Most of the oil in Wyoming occurs in arched beds, or anticlines and domes, and most of the anticlines or domes in the Big Horn Basin in that state yield oil, according to A. J. Collier in Bulletin 711-D of the U. S. Geological Survey. Two anticlines near Thermopolis, in Hot Springs County, known as the Warm Springs and Hamilton domes, were at first regarded as barren of oil, because the beds they contain do not include the oil sands of the proved oil fields. Tests by the drill, however, have shown that they contain oil in commercial quantities.

The Thermopolis anticline, on which the Big Horn hot springs, extensive travertine deposits, and sulphur mines are located, is a strong upfold of the earth's crust extending northwestward for about twenty-two miles. The Warm Springs domes, which are about five miles east of Thermopolis, are near the east end of this anticline. The Hamilton dome, which has also been called the Cottonwood anticline, is about twenty miles northwest of Thermopolis, just west of the west end of the Thermopolis anticline, from which it is separated by a low saddle. The northerly dip of the beds in both the Warm Springs and Hamilton domes is very moderate, but the southerly dip is about 45 deg. The hard-rock formations stand out at the surface as hog-back ridges, making the structure easily recognizable.

The oil sands in other parts of the Big Horn Basin are Cretaceous rocks, but the oil sand in the Warm Springs domes is a bed in the Carboniferous part of the Embar group, and that in the Hamilton dome is a bed in the Chugwater formation, or "Red Beds," which are of Triassic age.

## Extent of the Oil Lands of California

In the accompanying tabulation by the Standard Oil Co. the proven area of the California oil-fields is shown as 92,087 acres, equivalent to 143.89 square miles. In determining the figures the boundary lines of the proven area are drawn approximately 250 ft. outside producing wells. In case of outlying single wells the field is credited with about fifteen acres.

The figures therefore represent the actual proven area, and give no consideration to territory that is generally regarded as proven, but is not fully drilled. For instance, large areas of undrilled territory in the Buena Vista hills, although regarded as proven, are not included in the following tabulation. The proven acreage as shown is, therefore, low as compared with figures made by others.

TOTAL PRODUCTION, AREA AND PRODUCTION PER ACRE OF CALIFORNIA OIL FIELDS TO DECEMBER 31, 1919

| Field | Proven Acreage Dec. 31, 1919 | Total Production to Dec. 31, 1919 (Barrels) | Total Barrels per Acre to Dec. 31, 1919 |
|---|---|---|---|
| Kern River | 7,774 | 214,129,750 | 27,544 |
| McKittrick | 1,670 | 57,976,236 | 34,716 |
| Midway-Sunset | 40,695 | 357,875,039 | 8,794 |
| Lost Hills-Belridge | 4,851 | 38,400,955 | 7,916 |
| Coalinga | 14,990 | 229,541,407 | 15,313 |
| Lompoc and Santa Maria | 8,254 | 94,088,121 | 11,399 |
| Ventura County and Newhall | 4,961 | 23,103,728 | 4,657 |
| Los Angeles and Salt Lake | 2,760 | 55,641,527 | 20,608 |
| Whittier-Fullerton | 5,762 | 169,145,401 | 29,355 |
| Summerland | 230 | 2,288,627 | 9,951 |
| Miscellaneous | 200 (a) | 1,019,477 | 5,097 |
| Totals | 92,087 | 1,243,210,268 | 13,500 |

(a) Estimated.

**The Commonwealth Government** has decided to offer a reward of £10,000 for the discovery of oil in commercial quantities in Autralia.

# OIL NEWS FROM TEXAS AND LOUISIANA

## The Gulf Coast Field

**Crown Company Extends Holdings Southeast of Damon—No. 10 Jackson Proves a Disappointment**

The Crown Oil and Refining Co. has purchased forty acres in the H. P. Lockwood 160-acre tract, just southeast of Damon, on the southeast edge of Damon Mound, Brazoria County, for $12,000. This section of the district, according to oil men, is the most favorable part of the field still unprospected. At Damon Mound, the No. 10 Jackson well of the Sinclair Gulf Co. was reported to have come in flowing at the rate of 5,000 bbl. per day. This lasted for only a few minutes, however, and the well rapidly sanded up. So far all efforts to revive production have failed.

The West Columbia field production for the third week in February fell off to about 17,000 bbl. daily. The chief producers were: Humble Oil & Refining Co., 11,500 bbl.; Texas Co., 3,000 bbl.; Crown Oil & Refining Co., 1,200 bbl.; and the Gulf Production Co., 1,000 bbl. A re-test of the Texas Co.'s No. 30 Hogg showed only salt water. No. 28 Hogg is making about 600 bbl. initial production. In this county, the Freeport Sulphur Co., aside from its activities at its Bryan Heights sulphur works, is drilling at Stratton Ridge and McNeil's Mound. At Stratton Ridge, its No. 4 well is now about 1,200 ft. deep. An oil showing was struck in its No. 3 well, on the northeast end of the ridge, but this was killed by water inflow. At McNeill's, No. 1 well is now 1,650 ft. deep. Southwest of Angleton, the well of the Angleton Co-operative Oil Co. is developing into a deep test, now being over 3,100 ft. deep.

The No. 1 Becker well, being drilled by the Empire Gas & Fuel Co. near Benavides, Duval County, and reported recently as being a gusher, made two or three small heads of oil from a sand below 3,490 ft. Whether this flow will be maintained, is questioned by oil men. Much excitement prevails in southwest Texas in consequence of this strike.

Drilling in Harris County is being done at Goose Creek, Humble, Hockley, Pierce Junction, Cross Timbers, Crosby, and many other places. At least eighteen or twenty wildcat wells are in the process of drilling or rigging up at the present time. At Hockley both the Gulf Production Co. and the Texas Exploration Co. are actively engaged, but without commercially successful results to date.

Hull Field, Liberty County, made about 5,500 bbl. daily during the third week in February. Two big wells were completed during the week, the Texas Co's. No. 2 Palmer, which came in flowing 3,000 bbl. daily, and the Gulf Production Co's. No. 2 Baldwin, flowing 1,000 bbl. It is thought the Texas Co's. well, which is the biggest well of the field, may continue flowing for some time. The Empire Gas & Fuel Co. is doing considerable work with encouraging results. Oil is now standing in its No. 1 Barngrover well, and arrangements are being made for pumping. The Big Four and Crown Oil & Refining companies are arranging to pump one new well each. With these new completions, the field's production should soon increase. Drilling by the Empire company south of Dayton has been greatly hampered by the overflow of the Trinity River. As this has subsided, work will probably be resumed at once.

Orange County wells have not made any encouraging discoveries recently. The Shipbuilders Oil Co. is below 3,000 ft. in its No. 1 well, and the Brown Oil Co. has stopped work at 3,500 ft. in its No. 1 Luce well. The Orange Oil Co. has a fishing job below 2,800 feet. The Gulf Production Co. is rigging up preparatory to beginning drilling.

## Houston Ship Channel Refinery Ready

The new refinery recently built on the Houston ship channel by Monroe & Hughes, and taken over by the Port Houston Oil & Refining Co. after the consolidation, is receiving oil from West Columbia through the Texas Pipe Line Co., and operations will start at once. The initial capacity of the refinery will be 6,000 bbl. of finished product monthly; and this will be increased to 10,000 bbl. by summer. The company will specialize in the manufacture of high-grade lubricating oils, and will sell through jobbers and exporters exclusively. In addition to this refinery, the company owns a considerable acreage in various parts of the Gulf Coast country.

## Another Homer Gusher

The "Boston News Bureau" says that the second completion, in deep sand, of the Frost Oil Co. in the Homer field has come in, blowing off the casing head. The initial production was rated at 25,000 bbl. daily. The well is the most southerly completion in the 2,100-ft. sand. A 500-bbl. well has also been completed on the Ardis farm in the Bull Bayou district.

The oil and gas division of the Texas Railroad Commission has requested that everyone assist in the conservation of oil and gas by reporting to it any known waste. It seems a great deal of gas is wasted in an attempt to produce oil only. One complaint of this kind has been made in Eastland County by a farmer upon whose land one of the larger oil companies has a lease.

## North and Central Texas

**Burkburnett Producing Over 80,000 Barrels Daily—Iowa Park Field Developing Rapidly**

Burkburnett continues to be the chief producing field of Texas, making over 80,000 bbl. daily of high-grade oil. A number of new wells continue to be drilled there, about ten completions a day being made, adding weekly several thousand barrels of oil to the total production. This is not necessarily all net, however, as the big initial flow of Texas wells is short lived. The Iowa Park district, also in Wichita County, is increasing its production, now about 1,000 bbl. daily. A number of wells are being drilled, and several shallow wells were brought in recently as producers.

Two fires at Ranger on Feb. 21 destroyed the El Paso Hotel and adjoining property, and the stables of the Seybold Teaming Co. with thirty-two draft horses. The total losses are about $55,000.

A well thirty-two miles north of Brownwood, on the Dyson farm, and just inside Callahan County, was brought in recently flowing about 1,000 bbl. This has stimulated activity in the northern part of Brown County, and many wildcat wells will be drilled.

The Steiner Oil Corporation has recently acquired 50 per cent of the United Producers Pipe Line Co., and a consolidation of the pipe-line and loading-rack facilities of the two companies in the Ranger field was announced recently. The latter company is a subsidiary of the Transcontinental Oil Co. As a result of this consolidation, the Transcontinenal refinery can be supplied immediately with its capacity of 6,000 bbl. daily. Development of the Steiner oil properties will be resumed.

## The Current Prices for Crude

Since the recent increase of 25c. per barrel in the price of crude oil, the Texas Co. is now paying the following prices for Texas and Louisiana crude delivered to its pipe lines at the various fields: Burkburnett, Electra, Petroliana, and North Central Texas, $3; Caddo, $3 for 38 deg. Be. or over, and graded down to $2.85 for above 32 deg., and $1.50 for less than 32 deg.; De Soto, $2.90; Bull Bayou, $2.65; Crichton, $2.50; Goose Creek, Hull, Humble, Jennings, Markham, Sour Lake, Vinton, and West Columbia, $2.

The Humble Oil & Refining Co. has advanced the price of crude oil 25c. per barrel, the increase taking effect Feb. 18. The scale of prices for oil in the pipe lines is now: Ranger, $3; Burkburnett, $3; Goose Creek, Hull, and West Columbia, $2.

Prices in all fields exhibit a marked tendency to increase with the growing world demand for petroleum products.

# THE MINING NEWS

## LEADING EVENTS

### Court Orders Butte & Superior To File New Statement

**Production Figures, Selling Contracts and Smelter Returns To Be Included in Accounting**

Within ninety days the Butte & Superior Mining Co. must file a new and detailed statement of its operations over the entire period in which the court found that it infringed flotation patents of the Minerals Separation company. This must be ready for submission to the court by May 18, 1920. The new accounting has been ordered by Judge George M. Bourquin of the U. S. District Court of Montana. Not only must production figures be submitted in detail but selling contracts and complete smelter returns must be placed at the disposition of Minerals Separation.

The court order calls for "a debit and credit account of the defendant's entire ore concentrating business from the commencement of infringement throughout the entire period . . . including the mining of the ore down to and including sales to the smelter, with all receipts and disbursements arranged in monthly totals, including the facts and figures as to tonnage, assays and reagents, together with copies of all contracts with smelters and of all smelters' complete returns, this account to show separately the water concentration and flotation operations."

All costs of mining and milling must be presented as well as depreciation during the period in question. Sales value of the various products together with terms of contracts under which the concentrates involved were sold must also be prepared.

### Coeur d'Alene Mining Companies Advance Wages

Employees of all mining companies in the Coeur d'Alene district of Idaho have received an increase in wages of 50c. per day, effective from Mar. 1, making the scale for underground men $5.75 per day. This action was taken at a meeting of managers on Feb. 17 and the announcement was officially made on Feb. 24. During the war the highest wage paid was $5.25 per day. Following the signing of the armistice, when the metal market was unsettled and weak, the Coeur d'Alene operators made a cut of $1 in the daily wages in anticipation of reduced living costs. These failed to materialize and on May 16 last year the rate was increased 50c., making it $4.75. About that time the rise in the price of silver came to the relief of the operators, and the high cost of living continuing, another increase of 50c. per day was made on July 16, which restored the war scale of $5.25.

### Radium Products To Be Made at Overland Mills, Denver

**Pittsburgh Radium Co. To Make Ferro-vanadium and Vanadium Steels at Former Cotton Mills**

The Overland Mills of Denver, Col., originally operated as cotton mills have been purchased by the Pittsburgh Radium Co. and machinery and equipment is now being installed to treat 120 tons of carnotite and 500 tons of vanadium ore monthly. This to be gradually increased in capacity and output.

The buildings are of brick, thirteen in number, with a floor space of over 130,000 sq.ft. W. J. Stevenson, the president of the company, announces that the company will begin a general manufacturing business of radium products within sixty days. Electric furnaces are being installed for the manufacture of ferro-vanadium, and eventually the company will produce the special vanadium steels.

The carnotite and vanadium ores will be supplied by the Radium Ores Co., a subsidiary corporation owning extensive deposits in the Paradox district of western Colorado and eastern Utah.

The Pittsburgh Radium Company, a Utah corporation, which is capitalized for $500,000, is the operating company, but all its stock is owned and held by the National Vanadium Products Co., a Delaware corporation, which is capitalized for the same amou.

The officers and directors of the two companies are the same except that Gail Borden, of the Borden Milk Co., represents the New York interests on the board of directors of the National Vanadium Products Co., while Mr. Cohen represents the same interests on the directorate of the Pittsburgh Radium Co.

The officers of the Pittsburgh Radium Co. are: W. J. Stevenson, president; J. H. Fuller, Cleveland, vice president; R. W. Russell, Pittsburgh, secretary; Edwin N. Ohl, Pittsburgh, treasurer. The directors include the above officers and Henry Fitzpatrick, of Pittsburgh, Alfred A. Cohen, of New York, and J. L. Fouter, of Pittsburgh.

### Men Returning to Work at Bingham Canyon, Utah

The strike situation at Bingham Canyon, Utah, continues to improve, and more and more men are returning to work. The movement has never been whole-hearted upon the part of the men, and those who struck did not represent the sentiment of the camp, having been induced to do so by outside influence on the part of the I. W. W., which sought to bolster the strike by the promise of a sympathetic strike at Park City. The latter failed utterly.

### Mining Events in Costa Rica

**Operations Hampered by Labor Shortage—New Gold Strike Reported in Talamanca District**

*Special Correspondence*

During January there was talk of discoveries of gold-bearing ore in the Talamanca district of Costa Rica. A Costa Rican company has been formed of all native elements to develop and work the property. This company has asked the government to help them by subscribing a certain amount of the stock and by having a road built to the prospect at government expense. They have been successful in the latter request, at least.

There has been a great discussion in the press by the owners of the prospect who claim that it is the famous Spanish mine "Tisingal" and certain academicians who claim that the Tisingal mine was located in Honduras. The discussion has taken the form of more of an argument over the authenticity of certain tracts than anything else, but has served to keep attention from the main point in view of the owners of the prospect, namely, the financial aid asked of the government.

In this Talamanca region are located the petroleum properties over which such a to-do has been made in politics in Costa Rica. The late dictator was supposed to have been placed in power by these oil interests, and certain deputies and officials in the dictator's government and the government which preceded the latter bribed to get necessary legislation to grant a concession for exploiting the oil. Several sets of interests were working at the game. To date no work has been done directly looking to the development of the oil. Whether or not there is any oil to be developed seems for the moment to be the matter of least interest. There is some local movement in the stocks of the various concessionaires. Considerable money has been concentrated in certain centers due to this movement, so why worry about production?

What is reported to be a very large sulphur deposit has been denounced in the San Carlos region and surveying is going forward. The sulphur is reported to run as high as 98 per cent and average better than 40 per cent. There is a considerable portion of the high-grade sulphur which to all appearances might be stick sulphur cast into large pieces. All the volcanoes of the country show deposits of more or less pure sulphur. The deposits are the source of much of the sulphur used in the country. It is not refined in any way but ground up and sold as it is.

The large deposit mentioned above is located in a long valley between two extinct volcano cones. It is said to be

several thousand feet wide and miles long; that is the statement that is made as to the size of the deposit, though hundreds wide and thousands long would probably be nearer the truth.

Production of gold and silver was very much reduced during 1919 because of a scarcity of available labor which still exists. This scarcity is due, not to any maximalistic or even socialistic trouble as in other parts of the world, but to a perfectly normal result of greatly increased production of agricultural products. There were strikes with various objects in view at La Union and at Abangarez.

During 1917, 1918 and nine months of 1919 taxes on gold and silver production amounted to from 10 to 15 per cent of the value of gross production depending on the rate of exchange for one mine, 4 per cent for another, 1 per cent for another and 0 for another, according to concessions granted to one or another of the mines and in other cases depending upon the standing of the mine with the dictator. Upon the fall of the dictator the tax was fixed at 3 per cent of the gross production of bullion plus the obligation to sell to the government New York funds corresponding to 15 per cent of the gold content at a rate 20 points under the current rate of exchange. At the present exchange this amounts to a little less than 4 per cent of the value of gross production. Under its concession the Abangarez Gold Fields pays 1 per cent of the gross production.

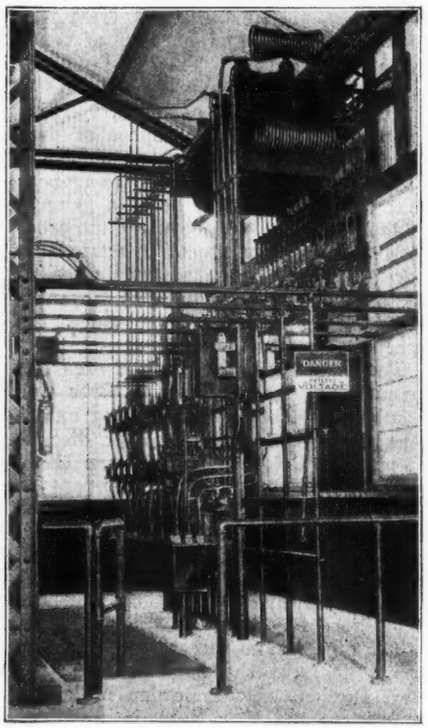
### Aguacate Mines Most Affected by Labor Shortage

The Aguacate Mines at San Mateo, being in the heart of the agricultural district, suffered more in proportion from the scarcity of labor than the other mines. The tonnage produced in 1919 was less than in 1918, and of lower grade. The net profit was, nevertheless greater than in any previous year except 1917. This was due to a reorganization of the staff, a changed mining system, economies in mining, milling and cyaniding, closer control of all operations, and rearrangement of flowsheet in the mill and cyanide plant. The lowering of costs due to the above causes has brought into the class of commercial ore a great deal of ground which was unprofitable under former conditions.

Ore reserves were increased in spite of adverse conditions and the lack of labor. All ore produced by the company came from the Quebrada Honda mine. Ore has been developed beyond both the north and south limits of the orebody as heretofore known. It is proposed to make available a still greater quantity of material not now classed as profitable by a simple modification of the treatment.

The production of the Abangarez Gold Fields has averaged $600,000 yearly for the last five years. It was lowered to about two-thirds of this amount in 1919, on account of the scarcity of labor and an unexpectedly low result from ore reserves in the Tres Hermanos mine. Little development has been done in this mine as in the other mines of the country during the last few years. As a consequence the reserve of fully developed ore of the present mill-grade is rather low. On the other hand there are a great many known bodies of free milling ore of low grade which are now being developed at depth.

The Abangarez company is reported to have acquired the La Luz mine and several other properties on its concession and near it. The La Luz property will be linked up with the Tres Hermanos by a 5-mile narrow-gage railway and a 4,000-ft. aerial tramway. The La Luz vein, though narrow, is expected to produce comparatively high-grade




SWITCHBOARD OF 1,250-HP. DIESEL ENGINE, OLD DOMINION COPPER MINING & SMELTING CO., GLOBE, ARIZ.

ore, which, combined with the ore now being produced in Tres Hermanos, is calculated to bring up the average mill heads to $8 per ton. About $135,000 worth of ore has been blocked out in the La Luz vein to date.

The Esparta Gold Fields, Ltd. has been developing the Santa Clara mine near Esparta. Several bodies of ore of fair grade have been found, together with two small bonanzas. The property includes several veins from a few inches to several feet in width, the values varying about in proportion to the width of the veins. A 20-stamp mill was purchased and five stamps put in commission. Little ore was milled as most of the values were going over the tail end of the plates. An attempt was made at cyaniding with but little success. The obvious trouble is a lack of experienced technical men.

During the war the peninsula was thoroughly prospected for manganese. Two concerns, the Costa Rica Manganese & Mining Co. and the Nicoya Mining Co. were the only ones to produce ore in any amount. The latter produced 2,000 tons in three years and closed down at end of the war, selling its ore on hand to the former company.

The Costa Rica Manganese & Mining Co. opened up workings at Playa Real on the peninsula of Nicoya and produced 14,000 tons of ore of very superior grade before its exhaustion. After Playa Real was exhausted operations were transferred to Curiol, fifteen miles inland near Santa Rosa. The surface extent of the latter deposit is much less extensive than that of Playa Real. Up to June, 1918, the Curiol property had produced 20,000 tons of ore averaging 52 per cent manganese and 8 per cent silica and worth approximately $60 per ton at war prices. The ore was hauled from the mine by motor trucks and by a 5-mile narrow-gage railroad. Since June about 500 tons of high-grade ore has been extracted monthly. There are in reserve more than 20,000 tons of ore blocked out.

Several other prospects, among them El Tamarindo, are reported to be very promising, or at least surface indications are. The fate of these manganese properties lies with the ferro-manganese market. At present prices it is not practicable to ship anything but the cream of the ore, and in these, as in most mines, the proportion of cream is small.

Conditions at La Unión mine of the Costa Rica Mining Co. are reported to be most favorable except for the labor scarcity. Development is now progressing satisfactorily and good ore has been reported. This mine is one of the steady producers of the country.

## B. C. Boards of Trade Would Bar Foreign Engineers

Several resolutions dealing with the mining industry of British Columbia were passed at the recent annual convention of the Associated Boards of Trade of Eastern British Columbia. The resolution calling for the passage of an "Engineers' Profession Act," which, it is expected, will be placed before the Provincial Legislature, is objected to on the ground that it would exclude all foreign engineers except those who are duly qualified members of the Association or have a temporary license from its Council. The effect of this, it is claimed, would be to bar engineers and others coming into the province as the representatives of outside capital seeking investment and, it is argued, such a result would be a severe blow to the mining industry.

Another resolution relates to the taxing of "so-called" profits from mines. Allowance it is stated should be made for the depletion of mines in assessing the income tax.

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Indian reservations of British Columbia have been declared open for mining and prospecting for gold and silver as from April 1, next.

## Platinum Concession Offered as Soviet Guaranty

**Credit Note Issue Planned To Be Backed by Platinum Reserve — Platinum Notes for Foreign Payments**

Soviet Russia in a peace proposal to the great powers, as announced in a press dispatch on Feb. 26, promises to withdraw the decree annulling Russia's foreign debt, restoring 60 per cent of the liability, and promises also to pay arrears of interest, giving as guaranty for the fulfillment of its obligations considerable mining concessions of platinum and silver to an Anglo-American syndicate.

In return and in addition to the formal peace treaties the Soviet government would require Great Britain and other countries to abandon all intervention in Russian affairs. It also proposes that the United States allow a credit to Russia conditioned upon considerable concessions in that country. It pledges itself to establish democratic principles in Russia and to call a Constituent Assembly.

The Soviet government will issue a new type of credit note in denominations of 50, 100, 500 and 5,000 rubles, backed by reserves of platinum of the value of 37,500,000 rubles, according to a dispatch from Berlin. The issue will be limited to 65,000,000 rubles, and the government will be ready on call to convert them into platinum coins.

Platinum notes will be used in payment of foreign purchases made direct by the government. To Russian citizens they will be paid out by the state only in exchange for commodites of practical value. Such citizens as deliver goods will then be allowed to trade directly with foreigners, using the notes as currency.

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Onyx is to be quarried north of Kingman, Ariz., and three miles from railroad transportation by J. A. Monihon, of Phoenix, and W. H. Larkin, of Prescott. The stone, which is of fine quality, is to be shipped to the coast for dressing.

## Old Dominion's Diesel Engine Two Years in Operation

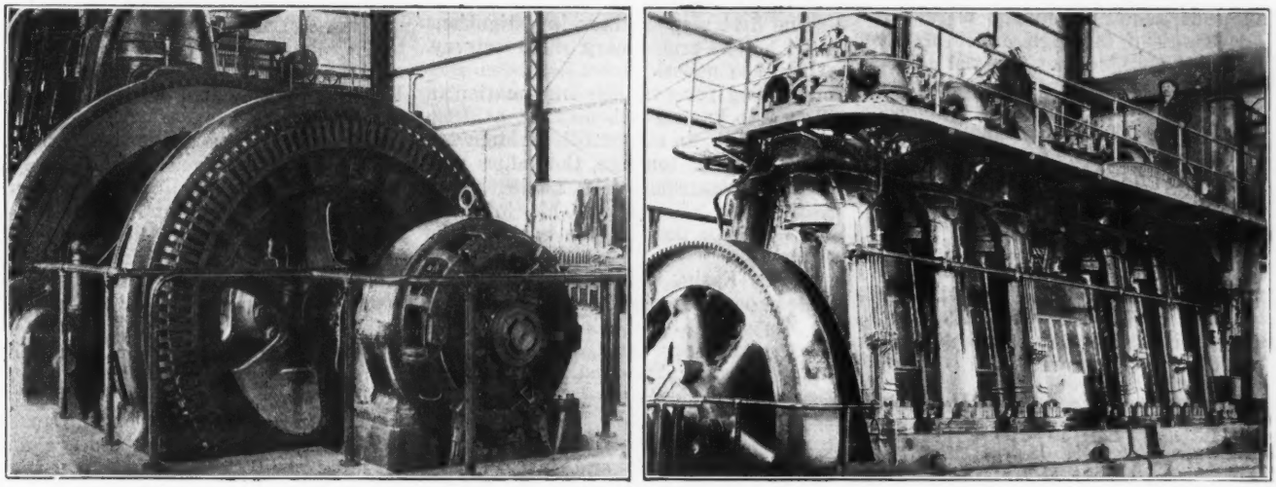
The Diesel engine of the Old Dominion Co. at Globe, Ariz., is a five-cylinder vertical Nordberg-Carels Diesel, with a two-stroke cycle. Its speed is 180 r.p.m., and it is rated at 1,250 b.hp. at 3,750 ft. altitude. It has a 26-in. stroke and a 20¾-in. bore. It is direct connected to a Westinghouse 850-kva. three-phase, 60-cycle, 2,300-v. generator.

The scavenging air pump is at the end of the engine, in line with the power cylinders and the three-stage compressor that furnishes the air for fuel injection is at one side of the scavenging pump. The scavenging air is about 3½ lb. per sq. in. gage pressure and the fuel injection air, or the blast, is usually between 1,100 and 1,200 lb. per sq.in. The compression in the power cylinders is about 500 lb. per sq.in. for a load of about 700 kw.

The engine when in good condition will carry a sustained peak of 800 kw. The average load is about 675 kw., ranging from 600 to 750.

The average fuel oil consumption is about 0.75 lb. per kw.-hr. delivered to the switchboard. This compares with 1.9 to 2 lb. per kw.-hr. for the 750-kw. turbines. The lubricating oil consumption is five to seven gallons per day, with an average of about six.

The engine occupies a space 14 ft. wide by 16 ft. high by 46 ft. long, including the generator. The engine has been in operation for two years.



DIESEL ENGINE, 1,250 HP., AT PLANT OF OLD DOMINION COPPER MINING & SMELTING CO., GLOBE, ARIZ. ON LEFT IS SEEN ENGINE'S GENERATOR AND EXCITER

## Gold Prospect at Copper Lake, Man., To Be Diamond Drilled

A syndicate has been formed by J. P. Gordon, who last summer made a gold discovery in the Copper Lake district of northern Manitoba, to work the property. A contract for drilling on the larger of two parallel veins has been let to the Smith & Travers Co., of Sudbury, at $50,000, and it is expected that the work will be completed in August.

## Power Shortage Hinders Operations in the San Juan

**Western Colorado Power Co. Has Reached Plant Capacity—Other Motive Power May Be Utilized**

Announcement by the Western Colorado Power Co. that it has already reached a maximum output with its present equipment indicates a serious condition for the San Juan. This company is the only electric power company in the district and has furnished excellent service, practically all mining power being furnished by the company. The shortage is due, however, only to lack of equipment, the demand having grown to capacity of plant. The capacity was reduced a couple of years ago by the failure of one of the company's water carrying flumes at Telluride, but the storage in reservoirs has been insufficient, and this shortage has so far been made up by the operation of the auxiliary steam plant at Durango. This, incidentally, has necssitated a "surcharge" during the winter months, all users of over 10 hp. paying a pro-rated extra charge. To date the company has managed to keep its customers going in winter, with a few restrictions.

Now, however, the rapidly increasing demand has brought about a crisis. The Liberty Bell, one of the largest customers, gave notice that they would shut down late last fall, permanently, and it was expected that this would release considerable power for new customers. The Bell then discovered a new oreshoot of considerable size and richness and will resume its former consumption of power as soon as permitted. In consequence, new concerns trying to start up mines as part of the recent mining revival are confronted with the announcement by the company that unless the latter sees enough assurance of permanence, which will allow of new equipment being installed, no new contracts for power will be entered into. New concerns may have power during the flood-water season, May to August, inclusive, but no promise of power after

August will be given. This will allow the smaller concerns trying to develop during the summer opportunity to go ahead with mine development, but gives no assurance of operations in the future. This is a serious matter, for there are a good many new operations in prospect, especially in Ouray County. Several are about ready to begin, and in some cases machinery is already on the way.

The problem is resolving itself into whether the power company will see enough assurance of permanence in the revival to install new equipment, or whether the new operators will equip with other power. It is hardly probable that there will be many installations of other motive power because the power company announces that it is considering the enlargement of its plant, particularly of storage facilities for the heavy run-off. However, the new operators cannot risk delay, as most of them are anxious to take full advantage of the high prices of silver and it is possible that internal combustion engines will receive serious consideration. Steam plants will not be much favored because many of the mines are too far from railroad, especially in winter. If the revival continues to increase it is quite possible that the power company will feel justified in adding equipment sufficient to take care of the increase, but as they want the test of time it is also quite possible that a field will develop to some extent for 50- to 150-hp. units of other motive power.

## Tonopah Placers Co. Insures Employees

Employees of the Tonopah Placers Co. operating at Breckenridge, Col., were recently insured by the company, which will bear the entire cost of the insurance by a contract with the Equitable Life Assurance Society of the United States. The amount of protection to each employee is graded according to length of service, as follows:

| | |
|---|---|
| After two months' continuous service in the company..... | $ 500 |
| After four months' continuous service in the company..... | 750 |
| After six months' continuous service in the company..... | 1,000 |
| After one year's continuous service in the company..... | 1,250 |
| After two years' or more continuous service in the company | 1,500 |

This insurance was effective Feb. 1, 1920, and is retroactive for past service of present employees. It is in addition to any compensation to which the employee might be entitled under the compensation acts of the state of Colorado. No medical examination is required, and no one is prevented from securing protection by reason of the nature of his occupation.

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Clement K. Quinn & Co., independent iron ore operators, will establish an office in Cleveland as preliminary to marketing their own ore, and to establishing a general agency for operating mines and selling ore for others.

## Low-Grade Complex Ores of Colorado To Be Studied

### Questionnaire Sent Out and Field Survey To Start Soon—Work Will Center at Golden

At the special session of the Colorado legislature, which convened in December, an appropriation of $15,000 was made to conduct investigations regarding the treatment of low-grade complex ores, to be undertaken during the present year by the U. S. Bureau of Mines and the Colorado School of Mines at Golden. This appropriation is intended as only a preliminary contribution to prepare the way for extensive investigation of the problems of treating the low-grade complex ores found in many of the mining districts of the state. The life of several of the older and best known camps depends upon the extent to which such ores can be profitably treated.

The first step in these investigations will be a preliminary field survey. Already a questionnaire has been sent out asking for available information in regard to known orebodies not at present subject to successful treatment—their probable tonnage, the values represented, transportation facilities and availability of water. This information is to be used as the basis of the survey.

B. C. Essig, a mining engineer of wide experience, who is with the Bureau of Mines, will be in charge of the field work and is now at Leadville investigating local mining conditions and particularly the problem of the successful separation of the mixed lead, zinc and iron ores of that district.

Laboratory work and investigation of ore dressing problems at the Golden station will be in charge of Will H. Coghill, who has been brought from the Seattle station of the Bureau of Mines. Further assistance will be given by the staff of the Colorado School of Mines.

## Will Dismantle Portland Mill at Colorado Springs

The Morse Bros. Machinery & Supply Co. of Denver, have purchased the 600-ton plant of the Portland Gold Mining Co. at Colorado Springs. This plant, which was originally erected as a chlorination mill, was afterwards changed to cyanide process and treated the ores of the Portland mine from Victor, Col. After the erection of the mill at Victor, the ore was treated there and the Colorado Springs plant closed. Morse Bros. will dismantle and ship the material to their yards in Denver. All of the buildings are of structural steel, there being over 1,100 tons of this material. Rolls, crushers, roasters, steel tanks, motors, and other equipment compose the balance of the material. This was the last of about fifteen plants in Colorado that used the chlorination process for treating Cripple Creek ores. Practically all of these plants have been dismantled by the Morse Bros. company during the last ten years.

## Quebec Asbestos Industry Prospers; Chrome Unsettled

### Market Good for All Grades of Asbestos — Labor Situation Quiet —Fair Profit in Chrome

BY W. J. WOOLSEY

Business conditions in the asbestos industry continue buoyant. The firm demand which was formerly confined to the crude ore and longer fibres is now extended to the shorter grades as well until the limit of prosperity is only gaged by the limit of production. Under this condition the large producers at Thetford and Black Lake are striving for a maximum production, while the production zone is constantly becoming extended. At East Broughton and Robertson Station all the properties have revived that were producing in 1907-11 and Coleraine has developed one large producer, the Bennett-Martin Asbestos & Chrome Mines. The plant of the Harris Asbestos Syndicate is being rebuilt after the fire in the fall of 1918; also, in the vicinity of the Belmina Consolidated large operations are predicted.

Labor conditions have been singularly satisfactory; reasonable demands have been met by liberal treatment from the employer and co-operative effort has succeeded in keeping the I. W. W. below the danger line. Contract labor has been widely adopted and every encouragement given to efficient labor.

The underground system of mining adopted by the Jacobs Asbestos Co. is now working properly.

The Asbestos Corporation of Canada have completed their ore storage and crushing plant at Black Lake and their "glory-hole" system of mining is now in operation at their B. C. Mines. Their system of loading ores in the quarries by steam shovel has been adopted at their Fraser mine at East Broughton, while the Eastern Township property has adopted a caterpillar steam shovel which is reported to obviate many of the difficulties encountered in operating the old style on wheels or rails.

The Carey property is operating a dual system of steam shovel and underground mining. The quarrying system of this company is limited in depth by the lay of the orebody which has a dip of about 60 deg. from the horizontal, so that, after a depth of 80 ft., the amount of hanging wall to be removed becomes prohibitive.

Mechanical handling of ore at the high-grade mines at Thetford has been tried but without success owing to the necessity of carefully sorting the high-grade crude ore from the low-grade milling ore.

The Jos. Poulin property is now under operation and J. A. Jacobs, promoter and formerly controlling factor of the Jacobs Asbestos Co., has acquired the Boston Asbestos Co. at East Broughton and intends to reopen the mines and milling plant at once. He has also purchased the Clark property comprising Lots 23-24, R. A. Coleraine, and expects to develop it.

The chrome industry of Quebec remains in an unsettled condition. Prices for the last year have been sufficient to allow operations to be carried on at a fair profit, though the operators realize that this is due in a measure to scarcity of shipping space for transportation of ores from the Eastern ports. Several American manufacturers, however, have confidence that the Canadian deposits can compete with foreign ores and plants have been erected in the Black Lake-Coleraine district for the reduction of concentrates. The Mutual Chemical Co. of New York has just completed a mill equipped with a 4½ x 6 ft. Hardinge mill and the J. V. Belanger Chrome Co., representing the U. S. Ferro-Alloys Co., has almost completed construction of their 180-ton mill, equipped with one 7-ft. Hardinge mill. The practice of using stamps for reducing ore has been superseded by the use of the Hardinge mill. The Black Lake Asbestos & Chrome Co. are still mining chrome ore carrying about 40 per cent $Cr_2O_3$ at their underground workings at Caribou Lake but the demand is slow for concentrates below 50 per cent.

## Option Taken on Silver Islet Mine On Lake Superior

The old Silver Islet mine on Lake Superior has been optioned to United States interests. This mine, which has been lying idle since 1884, produced silver to the value of $3,500,000. It was discovered in 1868, on a little islet in Lake Superior, near the northern shore, which was not large enough to permit of the installation of a mining plant. The islet was built up by means of waste rock, and the mine was a regular producer for several years. The ore was a massive argentite and native silver, and although a 40-stamp mill was built, the total production in the shape of concentrates was only about 175,000 oz.

## Granby Company To Issue Bonds

At a special meeting of the stockholders of the Granby Consolidated Mining, Smelting & Power Co. it was voted to increase the capital from $20,000,000 to $25,000,000 and to issue $2,500,000 8 per cent debenture bonds. Stockholders will have the right to subscribe to the bonds at par in proportion to their holdings. The bonds are convertible into stock at 55. This entire issue of bonds has been underwritten by Hayden, Stone & Co. The company will receive between 95 and 96 for all bonds not taken by shareholders at par. The proceeds of the bond issue will assist to meet the cost of large additions to property account, most of which have been made from earnings.

The present ore reserves are in excess of 11,000,000 tons. There has been developed in addition more than 10,000,000 tons of lower grade ore estimated to contain over 150,000,000 lb. of copper. These values are recoverable and as soon as funds become available a concentrating plant to extract them will be built.

## Outlook in Michigan Copper Country

### Deeper Mining, Solution of Ore Handling Problem and Metallurgical Improvement Give Promise

By Homer A. Guck

At a time when there is an inclination to pessimism regarding the future of the Lake Superior copper mining district it may be advisable to give proper consideration to the three important factors that are most directly concerned in the future progress of this section. With regard to the successful producing mines that have operated for sixty and more years here there are two important considerations. One is the conclusion of plans for mining at extreme depth. Both the Quincy and the Calumet & Hecla have completed plans for mining 1-per cent copper ore at a depth of two miles and more from the surface. The hoists are being erected and the underground plans completed. In the case of the Calumet & Hecla hoisting from this greater depth will be done by underground hoists located at a point 8,100 ft. from the surface. At the Quincy the work will be done by a surface hoist with a capacity for handling material to a depth of 12,500 ft.

A second important factor in the continued commercial success of these mines is based on the certainty of perfecting a workable shovel that will solve, to a considerable degree, the labor situation as regards trammers. Numerous experiments have been made. Many shovels that have proven successful in iron mines have been tried. Recently models have been made of labor saving devices that are likely to be perfected within the year. A power shovel will solve the most difficult problem relating to underground labor.

A third factor is the steady improvement in metallurgical processes resulting in increased recovery of copper. In the Calumet & Hecla the retreatment of old sands is now yielding dividends, the cost of operation being very low.

There is also hope for the future in the systematic geological research which is to be carried on during 1920. Heretofore this has been very largely guess work of a hit and miss pattern. The Calumet & Hecla has plans that may be productive of valuable developments. Field work will be undertaken early this year.

In addition to this general plan by the larger companies, there is also some exploration work planned by smaller companies. The Seneca is one company that will be a producer of copper from now on. The Mayflower-Old Colony and Arcadian Consolidated companies have promising showings that will be developed as rapidly as opportunity and the character of the ground permit.

Total lake shipments of copper, as shown in the annual report of the Portage Lake waterways, for the year 1919, amounted to 34,507 tons, with a value of $811,542 for electryolytic and $12,493,743 for Lake copper.

## Utah Zinc Co. Building Plant at Salt Lake City

The Utah Zinc Co. is building a plant at Salt Lake City, Utah, to treat oxidized zinc ore chiefly from the Tecoma district in Nevada, near the Utah state line, and probably other ores. The plant is to cost $150,000, and the first unit using Wetherill grates and coke breeze will have a capacity of 40 tons daily. L. B. McCornick is president of the newly formed company; Melvin Sowles, vice president; Herbert Salinger, vice president; L. D. Foreman, secretary-treasurer, and James W. Wade, manager.

## Porphyries Reduce Dividends

A reduction in dividends was announced on Feb. 25 by the Chino, Ray Consolidated and Nevada Consolidated copper companies. The declaration on Chino was 37½c. a share, compared with a previous dividend of 75c. The Ray dividend was reduced from 50c. a share to 25c., and the disbursement on Nevada was 25c., as compared with 37½c. three months ago. The dividends are payable Mar. 31 to stock of record Mar. 12. Utah Copper maintained its dividend at $1.50 a share, the strong treasury position of the company being advanced as the reason for the continuance of the rate of three months ago.

Following the meetings of the directors of the four companies Charles Hayden issued the following statement:

"It was the belief of the Boards of Directors that with general financial conditions as they are today, and with production of copper still on a basis of 50 per cent., with price still low and with some problems of back taxation still to be settled, whatever dividends were declared this first quarter of the new fiscal year should be on an ultra conservative basis.

"The very strong treasury position of Utah left no ground for discussion as to declaring regular dividends. It was deemed wise, however, to make the reductions that were made in the other porphyries, though with the hope that before the end of 1920 the general financial conditions of the country and of the copper metal market in particular would be such that shareholders might receive for the fiscal and calendar year 1920 full dividends as paid in 1919."

## Recent Production Reports

Greene Cananea Copper Co. produced 3,000,000 lb. copper and 114,090 oz. silver in January compared with 3,600,000 lb. copper and 124,100 oz. silver in December.

Compagnie du Boleo's production of copper for January was 1,054,550 lb. compared with 933,097 lb. for December.

The Oriental Consolidated Mining Co., Unsan, Chosen, produced $94,335 in its January cleanup. Insufficient water for electric power or milling caused the decrease.

North Butte Mining Co. produced 1,940,060 lb. of copper in January compared with 750,840 in December.

# NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

## More Liberal Bill Drafted for War Minerals Relief

**New Measure Provides for Appeal to Court of Claims—Further Amendment Expected**

A bill providing an appeal to the Court of Claims of all War Minerals Relief cases has about been agreed upon by the Committee on Mines and Mining in the House of Representatives. There are, at this writing, still some minor differences of opinion among members of the committee, but the following draft of a bill has been agreed upon in its substantial particulars:

"That Section 5 of the Act to provide relief in cases of contracts connected with the prosecution of the war, and for other purposes, approved March 2, 1919, be and is hereby amended by striking out the words, "That the decision of said secretary shall be conclusive and final subject to the limitations hereinafter provided;" wherever they may occur in said section; and the words "That nothing in this section shall be construed to confer jurisdiction upon any court to entertain a suit against the United States" wherever they may occur in said section, and insert as a new section, the following:

"Section 6. That the Court of Claims is hereby given jurisdiction on petition of any individual, firm, company or corporation, to find and award fair and just compensation, adjudicate, determine and render judgment in accordance with the provision of Section 5 hereof, in the event that such individual, firm, company or corporation shall not be willing to accept the adjustment, payment or compensation so offered, or paid by the Secretary of the Interior, or in the event that the said Secretary of the Interior has failed or refused, or shall fail or refuse to offer satisfactory adjustment, payment or compensation as provided for in said section.

"That whenever any claimant shall file a petition in said court, all testimony taken in the case of any claimant and all documentary evidence introduced or considered before said Secretary or any commission appointed by the authority of said Secretary, shall be certified to the Court of Claims by the said Secretary of the Interior and shall be used and considered as evidence in said claim by said Court of Claims upon the hearing and trial of such claim in said court.

"Provided, That no payments heretofore made by the Secretary of the Interior or the acceptance thereof or any acquittance given by any claimant shall bar said claimant from the right of appeal as herein provided.

"Provided further, That the findings and awards and the judgment thereon in each case so determined by the Court of Claims, shall be paid upon certification by the Clerk of the Court of Claims, of the amount of such finding, to the Secretary of the Treasury from any balance of the sum of $8,500,000 hereinbefore appropriated by Section 5 hereof."

While the right of appeal to the Court of Claims seems to be desired very generally among war mineral claimants, it is pointed out by those familiar with the procedure before the Court of Claims that a large number of claims arising out of the Civil War are still before that court. Some are of the opinion that many meritorious war mineral claims would fail before the court because only very substantial evidence would be considered. The War Minerals Relief Commission, however, listens to hearsay testimony and takes into consideration many things which no court bound by rules of evidence, would entertain. In the matter of stimulation testimony, for instance, the commission accepts proof which under a stricter ruling would be thrown out.

In all probability an amendment will be offered to the bill which will forbid the payment of any part of an award by the commission if the case is going to be appealed. It is held that all cases probably would be appealed if the claimants were allowed to take such award as they can secure from the Interior Department and still have the right to go before the Court of Claims in an effort to secure an additional award.

Printed copies have just become available of the hearings before the Committee on Mines and Mining of the House of Representatives, in which the procedure with regard to the handling of war mineral relief claims was gone into thoroughly. A copy of the hearings may be obtained gratis on application to Paul Wooton, the Washington correspondent of *Engineering and Mining Journal*, 610-11 Colorado Building, Washington, D. C.

## Need of Public Works Department Again Pointed Out

The National Public Works Department Association, the New York committee of which is presided over by Adolph Lewisohn, issued a statement on March 1 drawing attention to evils that can be corrected by abolishing the old Department of the Interior and creating a Department of Public Works. Franklin K. Lane's opinions of the methods of running the Government which he expressed in his farewell message to President Wilson were given as additional reasons for this reorganization.

## General Leasing Regulations Being Formulated

**President Waited Until Tenth Day Before Signing Bill—Joint Committee Drafting Rules**

By waiting until the tenth day after its passage before signing the General Leasing Bill, the President caused much worry on the part of legislators and others interested in seeing the measure become a law. The rumor that the President intended to veto the measure grew stronger as the days passed. His signature was not affixed until late in the afternoon of the day on which the bill would become a law automatically.

A joint committee from the General Land Office, Geological Survey, and the Bureau of Mines is now engaged in formulating the regulations which are provided by the act.

## Steel Corporation Not Guilty of Violating Sherman Law

The U. S. Steel Corporation and subsidiaries do not form a combination in restraint of trade in violation of the Sherman anti-trust law, according to a decision handed down March 1 by the U. S. Supreme Court, three justices dissenting and two taking no part in consideration of the case. This decision, which marks the end of the nine-years legal effort on the part of the Department of Justice to break up the so-called "Steel Trust" denied the request of the Government for a dissolution of the Steel Corporation. The action was taken in affirming a decree of a Federal Circuit Court handed down in 1915, the Supreme Court's decision being delayed at the request of the Government because it did not desire to interfere with the Steel Corporation's war work.

## Board of Surveys and Maps Organized

The members of the board of surveys and maps, created by the President on Dec. 30, 1919, have met and perfected a permanent organization and have adopted by-laws and rules of procedure. This body was created "in order to coordinate the activities of the various map-making agencies of the executive departments of the Government, to standardize results, and to avoid unnecessary duplication of work." The board is directed to hold meetings at stated intervals, to which representatives of the map-making and map-using public shall be invited for the purpose of conference and advice.

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The magnesite and laboratory glassware tariff bills were reported favorably to the Senate March 2.

# NEWS BY MINING DISTRICTS

## ALASKA

Alaska Gold Mines Co. reports a deficit of $84,573 for the quarter ended Dec. 31, 1919, compared with a deficit of $27,289 in the preceding quarter and a deficit of $78,381 in the fourth quarter of 1918. The tonnage milled in the last quarter of 1918 was 692,534, of a gross value of 75c. per ton and yielding 60c. with a tailings loss of 15 cents.

## ARIZONA

### San Xavier District Near Tucson Active—New King of Arizona Buys Mill—El Tiro To Double Output

**Tucson**—The San Xavier district, south of Tucson, is showing notable activity. A rich silver vein has been reported cut in deepening an old shaft on the Swastika, owned principally by D. S. Cochran, John Heidel and E. A. Royse, of Tucson.

The San Xavier Extension has reached good ore at 425 ft. The Vulcan has set a new hoist on its shaft, now down 75 ft.

The Mineral Hill is reported to be planning for a 300-ton mill, on the basis of ore blocked out on the 5th and 6th levels.

Sahuaro has ore at 60 ft. and will sink to 175 ft. before crosscutting.

Construction of an 8-mile railway from the Mineral Hill property to the Nogales branch of the South Pacific is considered probable.

Charles P. Reiniger of the Reiniger-Freeman Mines Co. states that his corporation retains a half interest in the property that has been worked by him near Mineral Hill and denies a report that a receiver has been appointed.

**Dragoon**—A strike of a lead-silver ore running $75 per ton, on the property of the Texas-Arizona Mining Co., being worked under lease by J. H. Smith & Co., has caused much excitement in the Dragoon-Johnson mining district as it directly affects the entire district. More men are being put to work as fast as the ground can be opened up and working room made for them.

**Johnson**—The Arizona United Mining Co. has increased its force under ground and has added another shift of engineers and ore sorters which will increase shipments about one third.

All the machinery for the Keystone Copper Co. mill is on the ground and erection will start on arrival of millwright.

The vein of high-grade copper ore struck on the third level of No. 2 shaft at the Copper Chief mine, is now 10 ft. wide. This property is being operated by the Mining & Developing Corporation of Arizona. Martin Fishback is manager.

**Douglas**—The Swisshelm Gold-Silver Co. has been shipping ore to the Calumet & Arizona smelter carrying 88.8 per cent silica, $8.60 gold and $23.20 silver, eagerly taken for use as converter lining material. Ben Heney manager has ordered a 3-drill compressor.

**Bisbee**—Shattuck-Arizona is getting back on a profitable operating basis. The January silver production from the mill was 8,269 oz., which output is expected to have been at least doubled in February.

**Silverbell**—El Tiro has been keeping shipments down to about 1,500 tons of 8-per cent copper ore a month, realizing better than 250,000 lb. of bullion. When better conditions prevail in the bullion market, Percy Williams, manager, will double the production, though on a 6 per cent basis. The 200 level is being connected with the Williams shaft, which is to be used mainly hereafter. The principal area of stoping is now above the 200 level, whereon the orebodies developed at 50 and 100 ft. have been picked up though not as wide as above.

**Patagonia**—Diamond drilling has been started on the Three R property of the Magma Copper Co. at the end of a 400-ft. tunnel. W. C. Browning, general manager, was present to start the drilling, and was accompanied by Henry Crum, who came to study the character of the ore with respect to reduction by flotation.

The California group of three claims at Patagonia has been acquired by the Flux Extension Mining Co., which will ship ore expected to return $2,000 a carload in gold, silver and lead.

J. M. Little of Towanda, Pa., has taken over the Sunnyside copper group, which will be known hereafter as the Volcano, the old name of the principal claim.

**Ray**—For the three months ended Dec. 31, 1919, Ray Consolidated Copper Co. reports total profits of $647,226, equivalent to 41c a share on the 1,577,179 shares of stock. This compares with profits of $932,147 or 59c a share in the third quarter and $408,113 or 26c. a share in corresponding quarter of 1918.

In addition to copper derived from concentrating ores, there was a total of 46,276 lb. of copper contained in ores sent direct to the smelter. This, combined with the copper contained in the concentrates, brings the total gross production from both sources for the quarter up to 11,660,923 lb., compared with 11,670,969 lb. for the previous quarter.

During the quarter there was milled 397,100 dry tons averaging 1.813 per cent copper. The mill extraction for the quarter was 80.66 per cent of the total copper contained in the concentrating ores, compared with 80.33 per cent for the previous quarter.

**Wickenburg**—A mill is being installed on the Abe Lincoln copper property in the Constellation district, northeast of Wickenburg.

The old Devine mine, near Castle Hot Springs, is now being operated by Sam L. Boyer, a California miner, representing the Arizona-Washington Copper Co. In the same locality Stone & Baldwin have found rich silver-lead ore in an extension of the Montezuma and Wonder group.

At Aguila, to the west, the Bullard is shipping three carloads of copper ore a week. From the same station three carloads a month are being shipped by A. A. Ray from the old U. S. property.

**Yuma**—W. J. Johnson, manager of the New King of Arizona mine has purchased a stamp mill in Los Angeles for erection on the King property on the desert, northeast of Yuma. He states that recently a new vein was cut that approximates in grade the ore found on the property years ago. The new ore is 10 ft. wide and runs well in gold even beyond $250 a ton, in gold. Water for the mine and mill has been provided by storage in a mountain canyon. Mr. Johnson lately purchased of E. A. Fries the New King Ledge claim.

### Chloride District

BY S. FORD EATON

The Cerbat Silver M. & M. Co. is rapidly getting the old Elkhart mine in shape for development. The shaft has been repaired to below the 300-ft. level, ventilating pipe and blower installed and clearing up of the level is under way. Arrangements have been made with the Tennessee for compressed air to be used as power for the hoist and underground drilling. C. C. Perdoe is in charge.

The Hidden Treasure tunnel is advancing without delay. The face is in 200 ft. and connection by upraise will soon be made with the main shaft. When this is done, the present plans call for development of the ore in No. 3 vein.

The crosscut on the 100-ft. level of the Dardanelles mine has advanced 40 ft. It is expected that the main Tennessee-Schenectady vein will be reached within the next 20 ft.

Lessees on the Rainbow are hauling shipping ore. McIntyre, Nair and Hayward recently obtained the lease and work will be pushed steadily.

The Potosi property, formerly called the Bella Union, has passed into the hands of C. B. Schoenmehle. Active work has been resumed under Humphrey & Fay, engineers. The shaft was unwatered during January and sinking resumed at a depth of 116 ft. A No. 3 Cameron sinker has been added to the equipment and the work is being pushed with three shifts. The present depth is 200 ft. The shaft will be deepened for a sump, a station cut at the 200 level and a short crosscut driven to the vein. The plans include continuation of shaft to the 500 ft. mark. R. K. Humphrey is resident manager.

The Silver Mountain is now being operated under bond and lease by R. T.

Banks, Los Angeles. Lessees are driving an adit on the vein and taking out good-grade silver ore.

After a shut down of many months work has been resumed on the Copper Age. A crosscut from the face of main adit started about the last of January is now in 170 ft. It is hoped that the Blossom ledge will be reached within another 250 ft. Jack Clinkman is in charge.

## ARKANSAS

### Beulah Mill Burned Down—Philadelphia and Ben Carney Mines Transferred to Pittsburgh Interests

**Rush**—The concentrator at the Beulah mine was destroyed by fire in Feb. 20. It is supposed that it caught fire from the boilers. The property is under operation by the Arkansas Zinc Co. who state that they will rebuild the plant.

The Philadelphia and Ben Carney zinc mines at Rush have been sold to interests in Pittsburgh, Pa. The names of the purchasers have not been disclosed. The negotiations for the properties were conducted by J. W. McDanield, of St. Paul, Minn., former owner of the Ben Carney. The Philadelphia mine is equipped with a 100-ton concentrator. The Ben Carney has no mill, the ore from the mine being run through the mill on the Morning Star property.

## CALIFORNIA

### North Star Using New Tailings Reservoir—Afterthought Copper Buys Donkey Mine at Ingot

**Amador City**—The sinking of the winze from the 2,800-ft. level of the Bunker Hill mine, at Amador City, is progressing steadily, and it is expected that the proposed depth of 500 ft. will have been reached by April 1. A crosscut will then be run to cut ledges believed to be in this part of the mine.

**San Andreas**—The Comet mine now has the shaft down 190 ft. A drift will be run on the 200-ft. level. The vein is over 14 ft. wide, and averages $11 per ton. An 18-in. Gibson mill has been installed and concentrating tables are being put in.

The Buchanan Consolidated Mining Co., of New York, has taken charge of the Fine Gold mine, near Railroad Flat, and will unwater it at once with a view to developing the property.

Work at the Central Hill mine is being pushed vigorously. The shaft is down 115 ft., and will be sunk much deeper to strike the pay gravel.

**Angels**—The Carson Hill mine has let a contract to the Angels Iron Works, for a large rock crusher, part of the new equipment to be installed at Melones. The finished crusher will have a capacity of 500 tons of ore a day, and will weigh over 35 tons.

**Grass Valley**—The Alcalde Gold Mines Co. struck some very rich quartz on Feb. 15 in driving a drift on the 400-ft. level south in the Alcalde mine. The drift is in 150 ft.

The North Star Mines Co. has begun dumping sands and slimes into the new reservoir formed by changing the course of Wolf Creek. A 40-ft. trestle has been constructed, over which self-dumping push cars are operated.

**Nevada City**—The Coe mining property was bought by L. P. Larue of Grass Valley, for $1,025; and the Red Cross group, at Omega, was purchased by W. R. Martin, of Grass Valley for $1,388.73, both properties being sold by the Tax Collector, H. S. Lord, for delinquent taxes.

**Paso Robles**—The Carson Quicksilver Mining Co., carrying on development operations at Klau, has been incorporated under the laws of Delaware. The officers of the company are: G. B. Street, president; C. B. Feriday, vice president; C. Underson, secretary & treasurer. Ellard W. Carson is resident manager of the mine.

**Redding**—The Afterthought Copper Co. has purchased the Donkey mine, at Ingot, from Chester Lowman.

In the suit of the Mountain Copper Co. vs. Shasta County, to recover $15,000 in taxes paid under protest last December, Judge Van Fleet sustained the demurrer interposed by District Attorney Carter, the Court holding there were insufficient allegations of fraud in the complaint.

**Modesto**—The Gustine Magnesite Co. filed articles of incorporation with the County Clerk at Modesto on Feb. 12. The company is capitalized at 10,000 shares of par value of $1 each. The directors of the company are A. E. Needham, C. H. Johnson, and W. J. McGuire, all of Oakland, Cal. The company is to engage in general mining business near Gustine, Merced County, and in other sections of the state.

**Camptonville**—The Brandy City, Depot Hill, and Grizzly Hill mines will carry on mining by the hydraulic process this coming season. These properties will make a joint use of a new concrete barrier placed across the North Yuba River below Bullards Bar. The dam is 35 ft. high.

## COLORADO

### Colorado United Building Mill Near Wallstreet—Emma Mill at Dunton To Be Remodeled

**Wallstreet**—The Colorado United Mines Co., a New York corporation recently organized, has taken over and consolidated the Concord, Great Britain, Forest and other lesser groups, near Wallstreet, in Boulder County, and commenced the construction of a 100-ton concentration and flotation plant. A large force is now employed at mines and mill preparing for production which the management hopes to begin about July 1.

**Salina**—The Lincoln Silver Mining Co. is a new $2,000,000 corporation recently organized by Boston people to take over the Victoria properties near Salina. With the Victoria the company has acquired large holdings of contiguous property, and has announced a plan of extensive development including the driving of a tunnel which will unwater the mine near the 400-ft. level, and the sinking of the shaft 200 ft. deeper. Victor C. Alderson, president of the Colorado School of Mines, is consulting engineer.

**Dunton**—The Dolores Silver Mines, Inc., has been recently organized to take over the Emma mine at Dunton. Development work is to continue through the winter and, with the opening of the roads in the spring, the mill will be remodeled and equipped to treat low-grade ores.

An important discovery of high-grade lead carbonate is reported on the Mountain Spring level of the Wellington tunnel, operated by the Wellington company and on territory heretofore undeveloped.

**Taylor Park**—Local mining and business men at Aspen have organized the United Silver Mining & Milling Co. to take over the old Enterprise group in the Taylor Park district. This property has been inactive since 1910, when a cave-in at the mine caused a shutdown after almost 20 years of continuous operation. The 50-in. milling plant is being remodeled and the mines opened up for maximum production. The ore values are principally in silver.

**Telluride**—The work on the San Bernardo mill, mine buildings and tramway of the Valley View Leasing & Mining Co. is expected to be finished in May. It is in charge of Harry Doyle, contractor.

## GEORGIA

**Thomson**—The American Venture & Mines Corporation has decided to abandon its lease on the Columbia mine at Thomson as the mine has proved unprofitable and in their opinion does not warrant further investment.

## MICHIGAN

### February Shipments from Copper Smelters Greater Than in January

**Houghton**—Copper shipments from the smelters of the Lake Superior district were larger in February than in January. In fact there was practically no accumulation of metal at any of the plants. This is an unusual condition. Ordinarily there are no shipments in February excepting rush orders to fill unusual requirements. The only difficulty encountered in handling the output of copper from this district has resulted from the freight congestion at eastern terminals. The embargo at Buffalo, preventing rail handling on commodities other than food and coal, temporarily influenced shipments, but that was cleared up in ten days. Most of the shipments were in fulfillment of contracts made in January. Practically none of the copper was for foreign account.

**Kearsarge**—Ahmeek's richest territory continues in No. 2 shaft. This shaft has reached the 27th level in depth and the openings at this point are on a par with those shown throughout this territory. The work to the

north is in particularly good ground. The 26th level faces are being opened in a grade of copper-bearing material which indicates a continuance of Kearsarge lode values at better than 25 lb. to the ton. Ahmeek's remarkable fissure vein continues with depth. There is practically no change in the quality of copper "rock" that is coming from the North Ahmeek at this time. The 18th, 19th, 20th levels south of No. 3 shaft have reached the boundary and the levels to the north have been connected with No. 4 shaft.

**Hancock**—The returns from the 1,700-ton shipment of Hancock Consolidated rock that was sent to the mill last week showed an average of 15 lb. to the ton. The second shipment was made about March 5.

### Iron Country Operations
### Menominee Range

**Iron River**—The Laughlin Ore Co. will resume mining operations at the Forbes mine as soon as the repair crew completes its work. The property has been idle since last summer. There is considerable ore in stock and little additional stocking ground is available. It is not likely that a large force will be employed until shipping commences in the spring. It is rumored that the Spies mine, of the Cleveland-Cliffs Iron Co., will resume operations at an early date.

### Marquette Range

**Negaunee**—The Republic Iron & Steel Co. has resumed mining operations at the Cambria mine. A. C. Hansen, of Gilbert, Minn., formerly assistant chief engineer for the company, has been placed in charge. He succeeds John E. Nelson, who has been made general superintendent of the company's mines in the Michigan field. The Cambria was idle since last spring. About 100 men will be employed when operations are in full swing.

Because of a shortage of water in the Dead and Carp rivers, the Cleveland-Cliffs Iron Co. is operating the auxiliary steam turbine at the Maas mine. It is necessary to generate about 1,000 hp. by steam in order to meet the demands of the mines. The dry spell of last year did not permit of the storage of sufficient water to keep the water power plants operating to capacity during the winter. There is a great deal of snow in the district this winter and plenty of water is assured as soon as it begins to melt. It is likely that the company will construct another large dam on the Dead River in order to provide additional storage.

**Palmer**—The Isabella is the only mine being worked here this winter, but as soon as navigation opens in the spring work will be resumed at the Richmond, Empire and Maitland properties, all of which are worked on the open pit plan.

## MINNESOTA

### Cuyuna Range

**Ironton**—The Cuyuna Duluth is sinking its shaft 30 ft. deeper and doing other development work preparatory to resuming mining. The mine has been closed down all winter.

Clement K. Quinn & Co. has purchased the Mahnomen's open-pit equipment from A. Guthrie & Co., who has been doing the mining under contract, and will work the property itself. The Adbar Development Co. is drilling for Quinn on the Mangan No. 2 and is showing up good manganiferous ore. The property will be stripped as an extension of the Mahnomen pit.

**Riverton**—The Sagamore is sinking a 150-ft. shaft and will drift under the pit for drainage purposes. It has shipped three cars of ore to Wakefield for drying. The results of the drying test were satisfactory and the company will erect a drying plant this season. It will also experiment further with the idea of screening, shipping the oversize direct and sintering the undersize, which is expected to be about one-half of the material. The ore carries high moisture, and experimental washing carried on at the Rowe washing plant last season did not give the best results, owing to large tailings losses.

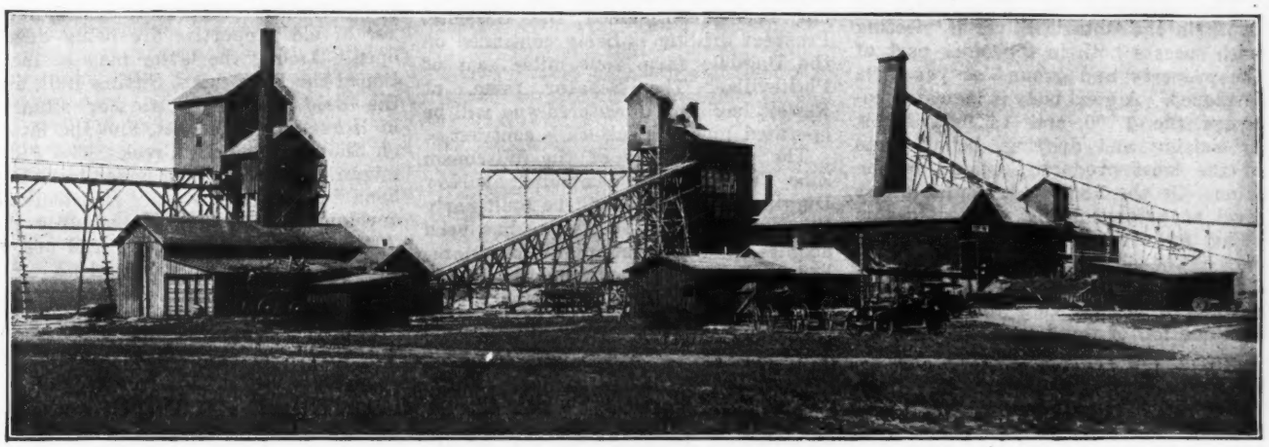
**Woodrow**—The Omaha Mines Co., which operated the Wilcox mine at Woodrow and which closed down recently and allowed the mine to fill, has petitioned the Court in bankruptcy proceedings.

## MISSOURI—KANSAS—OKLAHOMA

### Joplin-Miami District

**Joplin**—Evidence of the increasing adoption of the flotation process in the Joplin-Miami district is offered in the announcement that the Bethel Mining Co. in the near future will install a flotation plant at each of its three mills, the Bethel, Domado and Croesus. The equipment at the Bethel mill will be put in at once and the others during the spring. The company recently started sinking a new shaft at a point on the Domado lease about mid-way between the Domado and Croesus mills. Hopper and derrick are being erected and the shaft will be connected by incline tramway with the Croesus mill.

**Commerce**—The old Prairie concentrator at Commerce, Okla., has been purchased by E. E. Simpson and W. M. Cunningham of Miami, Okla., and will be used by them to mill dirt taken from the north portion of the Emma Gordon lease, where a new shaft has been put down. The south portion of this lease has been a consistent and heavy producer for ten years but the north portion never has been mined.



A PLANT IN THE JOPLIN-MIAMI LEAD-ZINC DISTRICT

**Picher**—Robert King, who has been superintendent for the Commerce Mining & Royalty Co. at its Webber mine, situated in Kansas just across the state line north of Picher, has resigned to take a similar position with the Dorothy G. Mining Co., now operating at Commerce, Okla. R. L. Pearson, until recently with the Munson-McLellan Co., has become superintendent of the Webber, which is one of the best producers of the district.

**Waco**—Plans are being made in the Waco camp whereby all the companies operating there will co-operate in an attempt to reduce the water level to at least 300 ft., and possibly to 350 ft. Drilling has shown mineralization to the latter depth, but the heavy head of water has effectually prevented any operations below 230 ft. to date. The Union Metal Mines Co., has put down a shaft to 290 ft. in the lime, and it is planned to use this shaft as a pumping shaft, and to install in it a 10-in. or 12-in. electrically operated centrifugal pump.

## NEW MEXICO

### Empire Zinc to Push Development of Republic Property

**White Signal**—Otto Forster and Jack Grissom have optioned their silver property to eastern people. The development work done this last year exposed considerable ore of good grade.

**Hanover**—Beginning Mar. 1 the Empire Zinc Co. put on three shifts, employing 150 men It is also the intention of the company to push development work upon the property which was recently acquired from the Republic M. & M. Co. Karl A. Strand is superintendent.

## UTAH

**Park City**—Ore shipments for the week ended Feb. 21 amounted to 2,264 tons compared with 2,359 tons the week preceding. Shippers were: Ontario, 612 tons; Silver King Coalition, 504 tons; Judge Mining & Smelting, 492 tons; Daly West, 433 tons; Daly, 112 tons; and Naildriver, 110 tons.

The campaign of development at depth in the Ontario Silver is meeting with success both in the older part of the property and ground as yet little developed. A good body is indicated between the 1,700 and 1,500-ft. levels by raising and drifting, below some of the most productive stopes in the mine. On the 1,800-ft. level the lowest level at present being worked, ore is being followed both to the east and west. The shaft and drift on the 2,000-ft. level have been cleaned out and unwatered with a view to finding the continuation of the fissure on the 1,800 level.

**Eureka**—Ore shipments from the Tintic district for the week ended Feb. 21 amounted to 158 as compared with 175 cars the week preceding.

The Dragon Consolidated is doubling its shipments of fluxing iron ore and the northern end of the property under lease to the Tintic Milling company is producing low-grade siliceous ores.

The shaft of the North Beck Mining Co. is down 1,525 feet, this being the deepest work so far in the northern section of the Tintic district. When the shaft has reached the 1,600 level prospecting will be started to cut a vein encountered higher up. E. J. Raddatz of the Tintic Standard is interested in this enterprise. As water has been encountered in the Ophohongo 60 ft. below the 1,800-ft. level, it has been decided to resume development above that level rather than to install pumping equipment

**Lark**—The Ohio Copper Co. reports to the state board of equalization $188,599 received from the sale of concentrates, (tonnage not given,) and extraction, reduction, and transportation costs of $230,386.

**Alta**—The Wasatch Mines at Alta has cut two fissures showing some ore in a crosscut from the drain tunnel which it is driving to get under old stopes of the Columbus Consolidated, abandoned in early days.

## WASHINGTON

**Nespelem**—The Reserve Silver Mining Co., with head offices in Seattle, has been organized to operate the Panama mine, two miles west of Nespelem, on a more extensive scale. This is a silver property that has been under development for the last year with encouraging results. H. P. Dickinson and W. W. Greenwood, of Seattle, and C. S. Craddock, of Vancouver, are the principal holders.

## WISCONSIN

### Zinc—Lead District

**Platteville**—The Vinegar Hill Zinc Co. has completed the shaft at the North Unity Extension, at Days Siding, and has connected it by a 1,000-ft. tramway with the North Unity No. 1 mill. Sinking of Meloy No. 2 shaft is progressing and Meloy No. 1 mill is being moved one-half mile to the new shaft site on the Fields land at New Diggings. A new shaft has also been started just south of Leadmine and immediately east of the old Drum, formerly the Nightingale; the property has been rechristened the Galenite. Prospect drilling is being continued on the Dugdale farm four miles east of Platteville. The Senator mine, at Rewey, has been unwatered and will be operated under a sub-lease contract.

The Booty shaft of the Wisconsin Zinc Co. has been completed at New Diggings and a mill will be built early this spring. The Blackstone has been acquired and the Champion-Church orebody will be developed from the Blackstone shaft. Milling is to start about the middle of March. The company also plans to resume operations at their Copeland mine at Shullsburg. Prospect drilling is being pursued at Platteville in the north part of the city, and at Benton-New Diggings on the Smyth, Trewartha, Temple and Winskell leases.

**Shullsburg**—The Paquette, a new company has commenced mining and milling at Shullsburg.

## CANADA

### British Columbia

**Stewart**—The Premier mine, of the Salmon River section of the Portland Canal district, British Columbia, is being operated despite difficulties with respect to labor. Some shipments, however, have come out over the winter trail. About 250 tons of high-grade ore was sent to the Tacoma smelter recently. R. K. Neill, one of the owners, has stated that a cyanide plant is likely to be installed after development has advanced sufficiently to assure a steady supply of ore.

The Spider Group, consisting of three claims lying north of Long Lake in the Salmon River section, which is under bond to the Algunican Syndicate of Belgium, is to be opened up as soon as practicable. Preparations are in progress. Fifty tons of supplies for the camp have reached Stewart and are to be taken over the trail immediately by means of packhorses equipped with snowshoes. Necessary machinery also is en route.

Another property on which work is being done, and which is to be developed extensively as soon as the season opens, is the Big Missouri. It is stated that the financial backing is available to establish with no loss of time the potentialities of this property and to put it on a producing basis, if development results are as satisfactory as is expected.

**Sandon**—The Silversmith Mines, Ltd., operators of the old Slocan Star Mine, near Sandon, B. C., have issued their annual report. Ore mined during 1919 is given as 14,558 tons, of which all but 325 tons went through the mill at the mine. Concentrates were marketed on both sides of the line, the smelter at Trail receiving 19 cars of silver concentrates and 17 going south. All but three of 24 cars of zinc concentrates shipped went to the United States. The amount of ore in sight is estimated at 90,000 tons.

**Windermere**—The Windermere district of British Columbia, East Kootenay, is receiving much attention from prospectors and operators and a number of old properties are being developed. Among the latter may be mentioned the Ptarmigan, Sitting Bull, and the Bald Eagle, the former situated in Horse Thief District, and the latter on Slade or Boulder Creek. The Ptarmigan is being worked under lease and bond by W. S. Watson. Considerable development work is planned for the Sitting Bull this summer. The ore of this property is a steel galena of a fairly good grade.

## MEXICO

### Hidalgo

**Pachuca**—Hugh Rose, consulting engineer of the Santa Gertrudis Co., Ltd., has advised the company that by the latter part of 1920 the El Bordo group, comprising the El Bordo, Malinche and El Cristo Mines, should be producing at the rate of 40,000 tons of ore per month. He has recommended that the Santa Gertrudis milling capacity should be increased to provide for the treatment of 60,000 tons per month, to be made up as to 40,000 tons per month from the El Bordo group and 20,000 tons per month from the Santa Gertrudis. The reduced production from the Santa Gertrudis mine itself will have the effect of prolonging its life.

The cost of increasing the present milling plant to bring it up to a capacity of 60,000 tons per month Mr. Rose has estimated at $300,000, and has advised that this expenditure would be fully warranted by the larger production and the opportunity afforded the company to take advantage of the prevailing high price of silver. The directors have approved and authorized this increase in the milling plant, and its construction will be started at once.

The company states that even after allowing for a reasonable fall in the price of silver below the present figure, a monthly profit of from £70,000 to £80,000 should be earned from the treatment of 60,000 tons of ore per month.

# COURT DECISIONS IN MINING CASES

By Wellington Gustin

## California Pipe Line Co. Held To Be Common Carrier

### Supreme Court Decides Against Producers' Transportation Co. — Line Devoted to Public Use

The petroleum pipe line of the Producers' Transportation Co. of California, used in transporting crude oil for pay from the San Joaquin oil fields to Port Harford, on the Pacific Coast, has been held to be a common carrier by the Federal Supreme Court, upholding the California Supreme Court.

The state Railroad Commission, after a full hearing, found that the pipe line was a common carrier, and directed the company to file its schedule of rates or charges and the rules and regulations under which the transportation is conducted. The company appealed to the courts from this order, and contended the state statute under which said order was given was repugnant to the Constitution of the United States, in that it resulted in taking property without due process of law, and impaired the obligation of contracts. The company further contended that the evidence showed conclusively that the pipe line was constructed solely to carry crude oil for particular producers under strictly private contracts, and that there had been no diversion of the pipe line to public use.

In rendering decision the United States Supreme Court said that if the pipe line was constructed solely to carry oil for particular producers under strictly private contracts, and never was devoted by its owner to public use, that is, to carrying for the public, the state could not, by mere legislative fiat or commission order, convert it into a public utility or make its owner a common carrier, for that would be the taking of private property by a state for public use without just compensation, which no state can do. But from the evidence the court found the company voluntarily had devoted its pipe line to public use, and had not withdrawn such dedication.

The state statute declares that every private corporation or individual operating "any pipe line or any part of any pipe line . . . for the transportation of crude oil . . . directly or indirectly, to or for the public, for hire . . . and which said pipe line . . . is constructed or maintained upon, along, over or under any public highway, and in favor of whom the right of eminent domain exists," shall be deemed a common carrier. Now, the grounds for concluding the pipe line had been devoted to public use were, first that by its articles of incorporation the company was authorized, if it so elected, "to establish and carry on . . . a general transportation business for the purpose of transporting . . . any of the oils . . . produced . . . by this corporation or any other person, firm, partnership, association or corporation"; second, that in acquiring its right of way it exercised the power of eminent domain, which was admissible only if the condemnation of property was for a "public use," and was by "an agent of the state," and in that proceeding asserted and obtained a judgment reciting that it was engaged in transporting oil by pipe line "as a common carrier for hire," and that the right of way was sought for "a public use"; and third, that looking through the agreements and agency contracts under which the transportation was effected, and having due regard to the agency's ready admission of new members and its exclusion of none, it was apparent that the company did in truth carry oil for all producers seeking its service.

Further, the court said, a common carrier cannot by making contracts for future transportation, as was done here, or by mortgaging its property or pledging its income, prevent or postpone the exertion by the state of the power to regulate the carrier's rates and practices. Nor does the contract clause of the Constitution interpose any obstacle to the exertion of that power.

## Anaconda Copper Mining Co. Loses Montana Tax Case

In the action by the Anaconda Copper Mining Co. against Ravalli County, Mont., and its treasurer, to reduce the tax assessment placed upon it, as increased by the County Assessor, the Supreme Court of Montana has affirmed the judgment of the lower court against the contentions of the copper company. The company claimed that the assessor did not give written notice of the increase at least ten days prior to the meeting of the County Board of Equalization, as required by law, and that, therefore, such increase made by the assessor was void.

The company filed with the Board of Equalization a protest against the increase as made by the assessor, stating that the same was a special appearance, and that by appearing it did not submit itself to the jurisdiction of such board for any other purpose than that of making a protest upon the ground that ten days' notice had not been given as required. The Supreme Court ruled that one appearing before assessing officers to protest against an increase in the valuation of his property, where no notice or insufficient notice has been given, waives the requirements of the statute. It said the copper company having had opportunity to appear before the board to oppose the increase, and, having actually appeared for that purpose, waived any irregularity in the giving of the notice.

## Wall Loses to the American Smelting & Refining Co.

### New Jersey Court of Errors and Appeals Affirms Judgment in Favor of Refining Company

In the case of Wall against the American Smelting & Refining Co. the decree of the Court of Chancery dismissing the bill has been affirmed by the New Jersey Court of Errors and Appeals. However, this court holds that there were assets in New Jersey belonging to the estate of F. Augustus Heinze, but that there were no bona fide New Jersey creditors, and therefore affirmed the case on that ground. (108 A 235.)

Regarding the assets, the court says Mr. Heinze was interested in some royalties on copper ore. The Silver King Co. had agreed with him in 1907 to sell him crude ore for a period of years. He assigned his interest to the Miners' Smelting company, which in turn sold its interest to McGuirk, who assigned to the intestate, so that the latter became legally entitled to the money that was payable under the agreement.

Heinze was indebted to the American Smelting company for a loan, and to secure this, he and the Miners' Smelting company pledged their interest to the American Smelting company. These transactions resulted in the American Smelting company standing in the place of the Miners' Smelting company, and being entitled to the output of the ore upon paying the royalty therefor. The estate, therefore, is entitled to this royalty, which constitutes assets in New Jersey within the rule of law stated by the court in the case of Amparo Mining Co. vs. Fidelity Trust Co. (75 N. J. Eq. 555), that the chose of action is in the jurisdiction where the party seeking equity would have to go to enforce it.

In disposing of the contention that there are bona fide creditors in New Jersey, the court says that neither Geer's claim, for salary, nor the Assets Development Co.'s claim, on the note assigned to it by Geer covering his salary, is real, and, furthermore, that neither is a New Jersey creditor of Heinze's estate.

The only other claim is that of the United Copper Co., a New Jersey corporation. This claim consists of two alleged claims of the Western Development Co., a foreign corporation, of which the wife of Geer, who figures so prominently in all these transactions, is the president, and Ruth Noyes Heinze, widow of deceased, a resident of New York. Both these claims were assigned to the United Copper Co. almost nine months after the date of the appointment of Arthur P. Heinze as administrator in New Jersey.

# ECHOES FROM THE FRATERNITY

## SOCIETIES, ADDRESSES, AND REPORTS

### Thawing Gravel by Cold Water

#### A Comparison With Results by Cold Water, by Hot Water and Steam

The use of water at the normal summer temperature of ponds, ditches, and creeks—in thawing perpetually frozen muck and gravel, is a recent development that promises to be of value to placer miners of Alaska. The data given below are abstracted from S. H. Cathcart's "Mining in Northwestern Alaska" (U. S. Geol. Survey Bull. 712-G, 1919).

Experiments were made during 1917 for the Alaska Mines Corporation, near Nome. Super-heated steam at a temperature of 1,000 deg. F., steam at boiler temperature, hot water at 150 deg. to 180 deg. F., and water at stream temperature of 52 deg. F., were used in the tests. Three holes were drilled to bedrock at the points of an equilateral triangle of 12 ft. side, and a test hole cased and kept open, was drilled at the center of the triangle. In the tests in which hot water and steam at boiler temperature were used, the thawed areas tended to cone downward, leaving horsts of unthawed ground on bedrock. Superheated steam at 1,000 deg. F., thawed a mass of gravel 66 ft. deep, 32 ft. in diameter at the bottom, and 27 ft. in diameter at the top. The thawed area was greatest on bedrock, and where a clay stratum was encountered the hole did not pinch.

Two 6-inch holes to bedrock were thawed by the cold-water method. One hole was 43½ ft. and the other 50 ft. deep. A 2-in. pipe was inserted to bedrock, and water was forced down the pipe. The ground began to slough in at the surface after five or six days. The volume of ice present in the muck and gravel was about one-third. Thawing was most effective where it was most desired, on bedrock.

During the season of 1918 in the Candle district, the cold water entered the ground at 42 deg. F., and left at 32 deg. to 34 deg. F., taking seven days to thaw an area of 8 ft. Steam had been tried under the conditions prevailing here and was not satisfactory. Water did the work well.

The same company used cold water in thawing ground 12 or 13 ft. deep, consisting of 4 to 5 ft. of clay and muck, 4 to 5 ft. of gravel and 3 ft. of soft blue clay bedrock. A battery of forty ¾-in. points spaced in squares 5 ft. apart required 48 hours to thaw perfectly, whereas 10-ft. spacing required 96 hours to thaw, and horsts of unthawed material were left on bedrock. The water entered the ground at 42 deg. F. and came from the thaw at 38 to 39 deg. F. Water under a head of 24 ft. (10.4 lb. pressure) was used. The thawing took place first and was widest on bedrock. It is estimated that 60 miner's inches of water was used to run the 40 points continuously. The efficiency of cold water for thawing was demonstrated.

SUMMARY

In the experimental work on the deep Nome gravels, the volume actually thawed amounted to about 50 cu.yd. a day for one point, using a pressure of about 30 lb. and water at 52 deg. F. The test on muck in the Candle district shows a volume of about 6 cu.yd. thawed per point per day where the water pressure was about 6 lb., the water temperature 42 deg. F., and the depth of ground 24 ft. The creek gravels thawed at the same locality were 13 ft. deep. Water at a pressure of about 10 lb. and a temperature of 42 deg. F. was used, and the rate of thaw is calculated at 6 cu.yd. per point per day. From these figures the rate of thaw in deep gravel would seem to be favorable rather than unfavorable, 20 points being required to supply 1,000 cu.yd. of thawed ground a day, as compared with 160 points required to supply a like amount of shallow creek gravel or muck.

The cost of thawing gravels by steam is as follows: The Northern Light Dredge Co. in 1911 thawed 9-ft. gravels at a cost of 35c. a cu.yd., using ten 10-ft. points spaced 7 ft. apart for 6 to 7 hours. The Esquimo Dredge Co. thawed 12-ft. gravels, using 90 points, 4 ft. apart for 24 hours, at a cost of 7½c. a cu.yd. If much sand was present in the gravel the cost was 9c. a cu.yd. Scott & Newburg thawed in the spring of 1918 for 8 days at a cost of 12c. per cu.yd.

### Idaho's Clay Resources

A bulletin will soon be issued by the Idaho Bureau of Mines and Geology on "The Clay Deposits of Idaho," the author of which is Frank H. Skeels, mining engineer of Wallace, Idaho. Mr. Skeels devoted several months last year to investigating and sampling clay deposits in all parts of the state, and this bulletin will give the results of his efforts in considerable detail. With the exception of two small fire-brick plants, nothing has been done toward developing the clay resources of Idaho, although Mr. Skeels' investigations indicate that there are numerous deposits of commercial value. The samples of clay collected by Mr. Skeels were tested by Prof. Hewitt Wilson, ceramist for the U. S. Bureau of Mines, in the laboratory of the state School of Mines at Moscow. "The Cement Possibilities of Idaho" will be the subject of a later bulletin, also to be prepared by Mr. Skeels.

### Franklin K. Lane Diagnoses Government Ailments

The retiring Secretary of the Interior, Franklin K. Lane, has supervised the plans and work of the U. S. Bureau of Mines and of the U. S. Geological Survey for the past seven years. Mr. Lane made valuable observations on the methods and conditions prevailing at Washington, and on surrendering his office gave to the public his private views regarding the conditions surrounding our best and highest public servants. We deem it our duty to help in spreading the same.

"Washington," Mr. Lane said, "contains statesmen who are politicians and politicians who are not statesmen. It is rich in brains and in character. It is honest beyond any commercial standard. It wishes to do everything that will promote the public good.

"But it is poorly organized for the task that belongs to it. Fewer men of larger capacity would do the task better. Ability is not lacking, but it is pressed to the point of paralysis because of an infinitude of details and an unwillingness on the part of the great body of public servants to take responsibility.

"Every one seems to be afraid of every one. The self-protective sense is developed abnormally, the creative sense atrophies. Trust, confidence, enthusiasm—these simple virtues of all great business—are the ones most lacking in Government organization. We have so many checks and brakes on our work that our progress does not keep pace with the nation's requirements.

"We could save money for the Government if we had more discretion as to how we should use that given us. For the body of the civil servants there should be quicker promotion or discharge and a sure insurance when disability comes. For the higher administrative officials there should be salaries twice as large as now given, and they should be made to feel they are the ones responsible for the work of the department, the head being merely an adviser and constructor of policies.

"As matters are now devised there are too few in the Government whose business it is to plan. Every man is held to details, to the narrower view which comes too often to be the department view or some sort of parochial view. We need for the day that is here and upon us, men who have little to do but study the problems of the time and test their capacity at meeting them.

"In a word we need more opportunity for planning, engineering, statesmanship above and more fixed authority and responsibility below."

## MEN YOU SHOULD KNOW ABOUT

**Harry Vivian** has been appointed chief engineer of the Calumet & Hecla and subsidiary companies, succeding the late Edward S. Grierson. Mr. Vivian was graduated from the Michigan College of Mines in 1914 and has been actively associated with local mining interests ever since. He was first employed as engineer for the Bigelow mines, and worked at the Ahmeek, Osceola, and Tamarack mines for several years. When these properties were taken over by the Calumet & Hecla interests Mr. Vivian's work came under the direction of Mr. Grierson's office, and he has been so associated from that time.

**A. W. Maxwell,** Captain in the 177th Tunneling Company, Royal Engineers, has just returned to New York City and will resume practice in the United States as a mining engineer. Captain Maxwell was last at Archangel, Russia, but served throughout the war. He enlisted as a private in the Canadian forces and served on the Western Front throughout the earlier and most strenuous part of the war. He will go into mining work in Colorado.

**A. D. Nicholas** has been appointed assistant treasurer of the Calumet & Hecla Company. Mr. Nicholas was clerk for the Centennial and Allouez properties when the management of these companies came under the Calumet & Hecla direction. Several years ago he was appointed controller for the Calumet & Hecla and allied companies and this appointment is a further promotion.

**Stephen Royce,** Madison, Wis., is moving his headquarters to Crystal Falls, Mich., where he will take care of the interests of the Jackson and Nevada mining companies. Mr. Royce had been with Dr. C. K. Leith since 1917, and will continue general practice for him, for Pickands, Mather & Co., and others. His temporary address is Jackson Mine, Alpha, Mich.

**James R. Jones,** law examiner for U. S. Bureau of Mines, is preparing a digest of the oil laws of Latin American countries, and was in New York City last week for the purpose of examining data. The proposed digest will perform a welcome service to the United States petroleum industry, now reaching out to new fields.

**J. M. Platt,** general superintendent for La Blanca y Anexas of Pachuca, Hidalgo, Mexico, resigned his position March 1, to devote himself to the development of a prospect in the Zacualpan district, State of México. Mr. Platt's present address is care of G. E. Trager, Calle Hidalgo 1424, Tacubaya, D. F.

A number of representatives of important American mining and engineering organizations sailed Feb. 21 for ports on the west coast of South America. Among the number were **Spencer Hutchinson,** of the Vanadium Corporation of America, **Louis Lefevre,** of the Andes Copper Co., and **W. S. Black,** engineer.

**W. E. Mitchell,** formerly of El Oro, is assuming the duties of General Mine Superintendent for La Blanca y Anexas of Pachuca. **Paul Mason,** recently mine superintendent at La Blanca, resigned on March 1 to start work on his prospects at Zimapan, Est. de Hidalgo.

**James E. Levis** has been appointed chief clerk for the Isle Royale Copper Co., succeeding the late Harry Lukey. Mr. Levis has been assistant clerk at the Isle Royale for a number of years, and is thoroughly familiar with the requirements of the position.

**Samuel W. Cohen,** general manager for the Bluestone Mining & Smelting Co., Mason, Nev., returned to Montreal about Feb. 24, after making an examination of the company's property.

**Hallet R. Robbins** has been appointed mill superintendent for Hanover Bessemer Iron & Copper Co., at Fierro, N. M. His personal address is P. O. Box 156, Fierro.

**H. H. Williams** has severed his connection with the Eastern Township property at East Broughton and is now manager at the Harris Syndicate, Coleraine, Quebec Prov.

**C. H. MacNutt,** formerly located in Burmah and recently with the American forces in France, is now manager of the Black Lake Asbestos & Chrome Co., Black Lake, Quebec Province.

**F. C. Loring,** of Toronto, has returned from a visit to London, and has been examining mining properties in the Porcupine area in the interests of an English mining syndicate.

**William T. Nightingale** has resigned from the staff of the Washington State Geological Survey, and is now on his way to England to join the staff of the Whitehall Petroleum Co.

**Franklin Wheaton Smith** has returned from a five months' stay in southern Chihuahua and is making examinations in the Lordsburg, N. M., district.

**G. W. Grayson,** formerly superintendent of the Hanover-Fierro property, has been making examinations in the Lordsburg, N. M., district.

**A. H. Fay** has resigned from the U. S. Bureau of Mines to undertake private consulting geological work in the mid-continental oil field.

**L. W. Emerson** has joined the engineering staff of the Chile Exploration Co. and will be at its New York City office, 120 Broadway.

**A. E. Drucker** has been appointed professor of metallurgy in the Wisconsin State School of Mines at Platteville, Wis.

**W. Motherwell,** recently from Broken Hill, Australia, is conducting flotation tests at the 85 Mine, Valedon, N. M.

**R. T. Hancock,** manager of Nigerian Tin Corp., Ltd., is returning to England after two years' absence in northern Nigeria.

**A. W. Newberry,** who has been in British Columbia recently, returned to New York City on March 1.

**C. M. Weld,** of New York City, returned from Brazil on Feb. 25, after an absence of three months.

## OBITUARY

**J. Peter Diederichs,** chief mining engineer for the Montreal Mining Co., died Feb. 18 at Hurley, Wis., from pneumonia. He was 31 years of age. He was a graduate of the Michigan College of Mines, class of 1909, and was engineer at the Bristol mine, in Crystal Falls, Mich., prior to 1916, when he entered the service of the Montreal company.

**Edward S. Grierson,** chief engineer for the Calumet & Hecla Mining Co., died recently at his home in Calumet, Mich., following a long illness from pernicious anæmia. He was a native of Ontonagon, Mich., where he was born in 1855, and entered the employ of the Calumet & Hecla Company when 14 years of age. In 1870 he joined the engineering staff as an office boy, and in 1901 he was made the company's chief engineer. He never spent a day in a technical school, but was considered an authority on both civil and mining engineering. His record of 50 years in the engineering service of a single company is seldom equaled. Mr. Grierson was a member of the Lake Superior Mining Institute.

## SOCIETY MEETINGS ANNOUNCED

**American Association of Engineers** holds its second annual railroad conference at Chicago, Ill., on March 15. W. W. K. Sparrow, corporate chief engineer of the Chicago, Milwaukee & St. Paul, will be chairman of the morning session, to be held in the Congress Hotel.

The meeting of the New York Section of the **American Institute of Mining and Metallurgical Engineers** will discuss at its monthly meeting on Mar. 3, "Coal Supply," "Coal Conservation," and "Coal Concentration." Talks on these subjects are expected from E. A. Holbrook, E. J. O'Connell, C. A. Meissner, and Edwin Ludlow. The bill for a National Department of Public works (H. 6649) will again be brought before the section.

The New York Section, **Mining & Metallurgical Society of America,** meets at Columbia University Club on March 4. J. E. Spurr will speak on "Political and Commercial Control of the World's Mineral Resources." Members are encouraged to bring their friends to this important meeting.

# THE MARKET REPORT

Published simultaneously in San Francisco and mailed from there to our Western subscribers as a special service pending the arrival of the *Engineering and Mining Journal*

## Silver and Sterling Exchange

| Feb | Sterling Exchange | Silver | | March | Sterling Exchange | Silver | |
|---|---|---|---|---|---|---|---|
| | | New York, Cents | London, Pence | | | New York, Cents | London, Pence |
| 26 | 337½ | 129½ | 82¼ | 1 | 341½ | 131¾ | 84 |
| 27 | 337½ | 129¾ | 82¾ | 2 | 344½ | 132 | 83⅜ |
| 28 | 339 | 130 | 83⅜ | 3 | 344½ | 131¾ | 83¾ |

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

## Daily Prices of Metals in New York

| Feb. March | Copper | Tin | | Lead | | Zinc |
|---|---|---|---|---|---|---|
| | Electrolytic | 99 Per Cent | Straits | N. Y. | St. L. | St. L. |
| 26 | 18.70@18.80 | 60½ | 61@61½ | 9.00@9.15 | 8.75@8.85 | 8.80@8.85 |
| 27 | 18.60@18.70 | 60½ | 61@61½ | 9.05@9.20 | 8.80@8.90 | 8.75@8.80 |
| 28 | 18.55@18.65 | 60½ | 61 | 9.15@9.30 | 8.90@9.00 | 8.65@8.70 |
| 1 | 18.50@18.60 | 61½ | 62 | 9.25@9.30 | 9.00 | 8.70@8.75 |
| 2 | 18.40@18.50 | 62½ | 63@63½ | 9.25@9.30 | 9.00 | 8.70@8.80 |
| 3 | 18.35@18.45 | 62 | 62¾ | 9.25@9.30 | 9.00 | 8.50@8.60 |

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

## London

| Feb. March | Copper | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | Standard | | Electrolytic | | | | | | |
| | Spot | 3 M | | Spot | 3 M | Spot | 3 M | Spot | 3 M |
| 26 | 121⅜ | 124¼ | 128 | 405 | 408 | 51⅜ | 52¼ | 61 | 63 |
| 27 | 120¼ | 122¾ | 128 | 400 | 402 | 51⅛ | 52⅛ | 59¾ | 61½ |
| 28 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| 1 | 120⅜ | 122¾ | 128 | 403½ | 406½ | 52 | 53⅛ | 59 | 61¾ |
| 2 | 119⅜ | 122½ | 127 | 411 | 415½ | 51½ | 53⅜ | 59½ | 62¼ |
| 3 | 118¾ | 121¾ | 127 | 409½ | 410½ | 49 | 50¼ | 58 | 61 |

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

## Metal Markets

**New York, March 3, 1920**

Monthly Average Prices for February

| | |
|---|---|
| **Copper:** | |
| New York Electrolytic..... | 18.569 |
| London Standard..... | 120.188 |
| London Electrolytic..... | 126.95 |
| **Lead:** | |
| New York..... | 8.814 |
| St. Louis..... | 8.601 |
| London ..... | 50.256 |
| **Silver:** | |
| New York..... | 131.295 |
| London ..... | 85.005 |
| **Zinc:** | |
| New York..... | 9.058 |
| St. Louis..... | 8.708 |
| London ..... | 61.338 |
| **Tin:** | |
| 99 per cent..... | 58.466 |
| Straits ..... | 59.932 |
| London ..... | 395.75 |
| **Iron and Steel, Pittsburgh:** | |
| Bessemer ..... | 42.954 |
| Basic ..... | 42.61 |
| Foundry ..... | 43.40 |

The metal markets were generally dull during the week, with no important breaks. Today's prices on the London market showed a rather unexpected decline on account of a fear of strikes, in view of the movement toward the nationalization of mines in Great Britain. In New York, copper declined to slightly ss than 18½c., with sales of approximately the same volume as for the preceding week. Lead held around 9c., with supplies scarce. Tin, after a sudden drop, showed a tendency to advance on a speculative demand, and zinc sagged slightly. Transatlantic freights were unchanged and transpacific rates remained at $12 from Hongkong and Kobe to San Francisco.

### Copper

The hoped-for improvement in the copper market has not yet materialized, this in spite of active business done by the chief consumers of this metal. It is extremely unlikely that the latter can hold off very much longer, as no large amount of second-quarter buying has taken place. The foreign situation has also shown some signs of improvement, as, for example, in the report from London that Germany might be permitted to seek a huge loan from neutrals and the United States. Even only partial opening of the European market should immediately raise the price of copper in this country, for vast quantities are needed.

Meanwhile, with demand continuing dull, it is probable that more copper is being produced than is being sold, and producers are shading prices, 18.35c. being accepted today for large lots. The outside market for smaller lots and for spot metal runs up to ½c. above this figure. No great rush seems to be taking place to buy copper at these figures, but it is unlikely that the price will drop much further.

Export buying is largely a case of speculation in foreign exchange, with the considerable variations that occur from day to day and even from hour to hour.

Copper Sheets—No change in base price of 29½c. per lb. set early in January. Wire 22@22½c. per lb.

### Tin

The chief interest in tin has apparently been in the London market, where speculators are in control. The local market acted in sympathy with overseas developments and advanced from a low of 61c. last Thursday to 63c. for Straits tin on Tuesday. Today the cables brought news of a considerable break in London, and the price here declined to 62¾c. Most of the business is in futures, for which a slightly higher price is asked than for spot.

Straits tin for future delivery was quoted as follows: Feb. 26, 61¾@62c.; Feb. 27, 62@62¼c.; Feb. 28, 62@62¼c.; Mar. 1, 63c.; Mar. 2, 64½@64¾c.; Mar. 3, 64c.

Arrivals of tin during the week have been: Feb. 21, 1,075 tons from Straits; Feb. 24, 25 tons from London; Feb. 25, 25 tons from London, and 100 tons from China; Feb. 26, 375 tons from Singapore; Mar. 1, 25 tons from Liverpool and 25 tons from Singapore.

London spot tin was quoted last week at 410½ on Feb. 23. This was in error, the quotation should have been 410.

### Lead

The strong market in lead continues, and producers are holding close to 9c. But little could be obtained at any time during the week under 8.85c., and today most buyers had to pay 9c., with even a slight premium over this figure being asked in some cases. Spot lead is almost unobtainable in any quantity, and even small lots can be had only at

an advance of about ¼c. over the market which we quote.

The New York price at the present time just about represents the St. Louis price plus freight, and most quotations for Eastern delivery are being made or the St. Louis basis.

The market is bullish, and the increased production which is expected will probably be absorbed. Inclement weather and the influenza epidemic prevented the February production from being increased to satisfy the demand.

### Zinc

During the week the price of zinc showed a tendency to decline, and today Prime Western grades could be secured at about ¼c. less than a week ago. Some of the large producers declined to do business at these lower prices, however, and the buying was largely confined to numerous smaller lots, which consumers apparently did not find a great deal of difficulty in securing. Current prices represent a good profit for zinc producers, and it is unlikely that much of any tendency to advance will be noted.

The export demand is quiet, and with so many variable factors to be considered, this side of the market appeals more to speculators.

### Gold, Silver and Platinum

**Gold**—Gold was quoted in London as follows: Feb. 26, 121s. 8d.; Feb. 27, 122s. 4d.; Feb. 28, 122s. 4d.; Mar. 1, 121s. 6d.; Mar. 2, 119s. 6d.; Mar. 3, 120s.

**Silver**—The market in New York advanced from $1.29½ on Feb. 26, to $1.32 on March 2, then declined to $1.31¾.

Mexican dollars at New York: Feb. 26, 99½; Feb. 27, 99½; Feb. 28, 99½; Mar. 1, 100; Mar. 2, 110¾; Mar. 3, 100¾.

**Foreign Exchange** — The European situation is as chaotic as ever, with no marked tendencies in any direction. Sterling has floundered around $3.40 for the week, with a closing quotation of $3.42½ on Tuesday, and today sold around $3.46. On account of the continued depression of sterling, the rate of exchange at which consular fees are collected in Great Britain has been changed to six shillings to the dollar. This is equivalent to $3.33 to the pound.

German marks showed a tendency to strengthen over the low of the last few days, on the news from London that a credit might be arranged for that country, and on Wednesday were worth about 1.03c. Francs closed on Tuesday at 14.21 to the dollar; Austrian kronen, 0.42c.; Italian lire, 18.32; Spanish pesetas, 17.30; and Canadian dollars were accepted at about 15 per cent discount.

**Platinum**—Market quiet, $145 per oz.

**Palladium** — $130 @$ 135 per oz. Steady.

**Iridium**—Quoted at $300. Scarce.

### Other Metals

**Aluminum**—Ingot 33c. per lb.

**Antimony**—Demand is strong, with scarcity of metal. Ordinary brands, both spot and futures, average about 11½@11¾c.; W.C.C., 12c., and Cookson's spot, 14¼c., small lots being sold.

**Bismuth** — Unchanged at $2.50 for 500-lb. lots.

**Cadmium** — Unchanged at $1.40 @ $1.50 per lb.

**Nickel**—Ingot, 43c.; shot, 43c; electrolytic, 45c. Unchanged.

**Quicksilver**—Quiet at $87@$88 per 75-lb. flask. San Francisco telegraphs $85; steady.

### Other Ores and Minerals

**Fluorspar**—Lump ore containing 85 per cent $CaF_2$ and not over 5 per cent $SiO_2$ is quoted unchanged at $16 f.o.b. mines at Tonuco, N. M.

**Pyrites**—Spanish pyrites is quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f., Atlantic ports.

**Sulphur**—Prices average $18 per ton for domestic and $20 for export, f.o.b. Texas and Louisiana mines. Practically no change in past two or three months. Export demand falling off on account of exchange, and domestic consumers are largely booked for the year.

**Chrome Ore**—Indian chrome ore of good quality has been offered at 70c. per unit without finding buyers.

**Manganese Ore**—Demand is active, and considerable business has been done. Imports from India and South America range from 70c. to 75c. per unit.

**Molybdenum Ore** — 70 @ 75c. per lb. $MoS_2$ for high-grade concentrate. Little business.

**Tungsten Ore**—The market is easier. Some Chinese ore was sold at $6.00 per ton. According to reports the British government has now sold its stocks of tungsten ore.

### Zinc and Lead Ore Markets

**Platteville, Wis., Feb. 28**—No open market sales of premium or Prime Western grades of blende ore are reported. Neither buyers nor producers were keen to make sales. Lead ore, basis 80 per cent lead, $100 per ton. Shipments for week are blende, 1,457; calamine, 90; lead, 100 tons. Shipments year to date, blende, 13,389; calamine, 600; lead, 1,425; sulphur ore, 106 tons. During the week 2,616 tons blende was shipped to separating plants.

**Joplin, Mo., Feb. 28**—Zinc blende, per ton, high $55.60; basis 60 per cent zinc, premium, $53.50; Prime Western, $52.50 @$50; fines and slimes, $50@$47.50; calamine, 40 per cent zinc, $35. Average settling prices: Blende, $51.44; calamine, $34, all zinc ores, $51.39.

Lead, high, $105.20; basis 80 per cent lead, $105; average settling price, all grades of lead, $101.40 per ton.

Shipments the week: Blende, 12,442; calamine, 37; lead, 1,933 tons. Value, all ores the week, $836,230.

Shipments two months: Blende, 99,383; calamine, 1,519; lead, 15,027 tons. Value, all ores two months, $6,808,620.

The continuous heavy shipment the last two months has removed all the ore from several large bins in the Oklahoma area, and the tonnage shipped has persistently fallen below the tonnage of ore sold, leaving some smelting companies with money advances that must be covered by future production. All estimates have evidently been considerably exaggerated, based on the large advance sales of ore. Some of the smelters, caught short on ore, are maneuvering for purchases that will give them immediate delivery ore.

### Iron Trade Review

**Pittsburgh, March 2, 1920**

Several of the large independent steel companies which have been staying out of the market until the price outlook should become clearer have been forced by the lapse of time to name prices to regular customers for second-quarter deliveries. It has been a remarkable feature of the steel situation for two or three months past that the independent producers, as a class, were sold up for such short distances. This arose from the fact that the smaller producers, who were charging fancy prices for early deliveries, could not sell at such prices for extended deliveries, and most of the larger producers would not take on orders at all. Though the Steel Corporation adheres to March 21 or Industrial Board prices, which means 2.35c. for merchant steel bars, one or two independents have made to preferred customers a price of 2.70c. for second-quarter deliveries, regarding this as a very close price, and prices of 2.90c. to 3c. have been made by several mills to ordinary customers. The lowest second-quarter price made by any independent producer on plates is 3.25c., this being done only by one concern.

The Supreme Court decision in favor of the Steel Corporation in the litigation instituted Oct. 26, 1911, will not alter the Steel Corporation's price policy a particle, that policy being to maintain March 21 prices indefinitely, or until conditions absolutely force a departure.

**Coke**—The coke shortage continues, but is restricting expansion in pig-iron production rather than curtailing production from the rate previously attained. It is entirely a matter of car supply for moving coke from the Connellsville region and moving coal to the byproduct ovens. The Connellsville production has been a few per cent less in the last fortnight than previously, but byproduct production has probably increased a trifle. Government price control continues, at $6 for furnace and $7 for foundry coke, per net ton at ovens, Connellsville region, but it is not certain that the regulations are being observed in all cases.

**Ferro-Alloys**—Prompt ferromanganese in small lots commands premium prices, perhaps to above $200, delivered. The regular price on domestic, for second half, remains at $160, delivered, though there are rumors that this might be shaded a trifle. English is nominal at $150, c.i.f. Spiegeleisen is $57@$60, furnace, for futures.

# MINING STOCKS

## Week Ended Feb. 28, 1920

| Stock | Exch. | High | Low | Last | Last | Div. |
|---|---|---|---|---|---|---|
| **COPPER** | | | | | | |
| Adventure | Boston | *175 | *100 | *100 | | |
| Ahmeek | Boston | 70½ | 68 | 68½ | Dec. '19, | $1.00 |
| Alaska-B.C. | N. Y. Curb | 1 1/16 | ⅞ | 1 1/16 | | |
| Algomah | Boston | | | 35 | | |
| Allouez | Boston | 35 | 33 | 33 | Mar. '19, | 1 00 |
| Anaconda | N. Y. | 58½ | 54¾ | 57 | Feb. '20, | 1 00 |
| Ariz. Com | Boston | 11⅞ | 11 | 11⅞ | Oct. '18, | .50 |
| Big Ledge | N. Y. Curb | 1/16 | ⅛ | 1/16 | | |
| Bingham Mines | Boston | | | 6 | Sept. '19, | .25 |
| Boston & Ely | Boston Curb | *90 | | *55 | | |
| Butte & Bal | Boston | | | 30 | | |
| Butte & Lond | Boston Curb | | | †*10 | | |
| Calaveras | Boston Curb | | | †1 | | |
| Calumet & Ariz | Boston | 64½ | 61 | 61¾ | Dec. '19, | .50 |
| Calumet & Hecla | Boston | 365 | 345 | 350 | Dec. '19, | 5.00 |
| Calumet & Jerome | N. Y. Curb | | | 1/16 | | |
| Can. Copper | N. Y. Curb | 1⅛ | 1⅛ | 1 1/16 | | |
| Centennial | Boston | 14 | 12½ | 12¾ | Dec. '18, | 1 00 |
| Cerro de Pasco | N. Y. | 48⅛ | 45¼ | 46⅝ | Dec. '19, | 1 00 |
| Con. Aris | N. Y. Curb | ⅛ | ⅛ | 1/16 | Dec. '18, | .05 |
| Con. Copper M | N. Y. Curb | | | 4¼ | | |
| Chile Cop | N. Y. | 17⅛ | 16 | 16 | | |
| Chino | N. Y. | 36 | 31⅞ | 32⅛ | Dec. '19, | .75 |
| Cop. Range | Boston | 43 | 42 | 42 | Dec. '19, | .50 |
| Crystal | Boston Curb | *49 | *40 | †*40 | | |
| Crystal Cop (old) | Boston Curb | 9 | *4 | †*4 | | |
| Daly-West | Boston | 4⅛ | 3⅞ | 4⅛ | | |
| Davis-Daly | Boston | 11⅛ | 10 | 10⅛ | Dec. '19, | .50 |
| East Butte | Boston | 14 | 12⅞ | 12¾ | Dec. '19, | .50 |
| First Nat'l | Boston Curb | 1 1/16 | 1⅛ | †1⅛ | Feb. '19, | .15 |
| Franklin | Boston | 3⅛ | 3 | 3 | | |
| Gadsden Copper | N. Y. Curb | 1¼ | 1¼ | 1¼ | | |
| Granby Consol | N. Y. | 39 | 36 | 3 ⅜ | May '19, | 1.25 |
| Greene-Can | N. Y. | 31⅜ | 31⅛ | 3 ⅛ | Feb. '19, | 1.50 |
| Hancock | Boston | 5 | 5 | 5 | | |
| Helvetia | Boston | 2⅜ | 2⅛ | 2⅛ | | |
| Houghton | Boston Curb | *75½ | *75 | † 75 | | |
| Howe Sound | N. Y. Curb | 4⅛ | 4 | 4⅛ | Jan. '20, | .05 |
| Indiana | Boston | | | 70 | | |
| Inspiration Con | N. Y. | 54⅜ | 50⅛ | 51⅜ | Jan. '20, | 1.50 |
| Iron Cap | Boston Curb | 12 | 10 | †10 | Feb. '19, | .25 |
| Isle Royale | Boston | 31⅛ | 30¼ | 31 | Sept. '19, | .50 |
| Jerome Verde | N. Y. Curb | | | 1/16 | | |
| Kennecott | N. Y | 29⅞ | 28 | 28⅛ | Dec. '19, | .50 |
| Keweenaw | Boston | | | 1⅛ | | |
| Lake Copper | Boston | 3⅜ | 3⅛ | 3⅛ | | |
| La Salle | Boston | 3 | 3 | 3 | | |
| Magma Chief | N. Y. Curb | ⅛ | ⅛ | ⅛ | | |
| Magma Copper | N. Y. Curb | 36 | 34½ | 36 | Jan. '19 | .50 |
| Majestic | Boston Curb | *23 | *15 | †*20 | | |
| Mason Valley | N. Y. Curb | 2⅛ | 2 | 2⅛ | | |
| Mass Con | Boston | 5 | 4½ | 5 | Nov. '17, | 1.00 |
| Mayflower | Boston | 9 | 8 | 8 | | |
| Miami | N. Y | 23 | 21⅛ | 21⅝ | Feb. '20, | .50 |
| Michigan | Boston | | | 6½ | | |
| Mohawk | Boston | 65 | 61½ | 62½ | Feb. 20, | 1.50 |
| Mother Lode(New) | N. Y. Curb | 5 | 5 | 5 | | |
| Nev. Con | N. Y. | 15⅛ | 14 | 14 | Dec. '19, | .37½ |
| Nixon Nev | N. Y. Curb | 15 | 13 | 13 | | |
| Nev. Douglas | Boston Curb | *20 | *12 | † 12 | | |
| New Arcadian | Boston | 3⅛ | 3⅛ | 3⅛ | | |
| New Baltic | Boston Curb | 4 | 2⅝ | 2⅝ | | |
| New Cornelia | Boston | 20⅛ | 19 | 20 | Nov. '18, | .25 |
| North Butte | Boston | 17⅛ | 16 | 1 ⅛ | Oct. '18, | .25 |
| North Lake | Boston | | | *50 | | |
| Ohio Copper | N. Y. Curb | | | 1/16 | | |
| Oneco | Boston Curb | *100 | *60 | †*60 | | |
| Ojibway | Boston | | | 2 | | |
| Old Dominion | Boston | 33 | 31 | 31 | Dec. '18, | 1.00 |
| Osceola | Boston | 48 | 47 | 47 | Dec. '19, | 1.00 |
| Quincy | Boston | 58½ | 58 | 58½ | Feb. '20, | 1.00 |
| Ray Con | N. Y | 20½ | 17⅞ | 17⅝ | Dec. '19, | .50 |
| Ray Hercules | N. Y. Curb | 1⅞ | 1⅞ | 1⅞ | | |
| St. Mary's M. L. | Boston | 47 | 47 | 47 | Dec. '19, | 2.00 |
| Seneca | Boston | 14⅞ | 14 | 14⅛ | | |
| Shannon | Boston | 1⅞ | 1⅞ | 1⅞ | Nov. '17, | .25 |
| Shattuck Aris | N. Y. | 12 | 11 | 11⅛ | Jan. '20, | .25 |
| South Lake | Boston | 1 | 1 | 1 | | |
| South Utah | Boston | | | *15 | | |
| Superior | Boston | 5⅛ | 5 | 5⅛ | Apr. '17, | 1 00 |
| Superior & Boston | Boston | 5 | 4¼ | 4⅝ | | |
| Tenn. C & C | N. Y. | 10⅛ | 9⅜ | 9⅜ | May '18, | 1.00 |
| Trinity | Boston | 1⅜ | 1⅜ | 1⅜ | | |
| Tuolumne | Boston | *99 | *85 | *85 | | |
| United Verd. Ex | Boston Curb | *39 | *36½ | †*37 | Feb. '20, | .50 |
| Utah Cop | N. Y | 72⅛ | 69 | 71 | Dec. '19, | 1 50 |
| Utah Con | Boston | 9⅛ | 8⅞ | 9⅛ | Sept. '18, | .25 |
| Utah M. & T | Boston | 2⅛ | 2 | 2⅛ | Dec. '17, | .30 |
| Victoria | Boston | 3 | 3 | 3 | | |
| Winona | Boston | 1⅞ | 1⅞ | 1⅞ | | |
| Wolverine | Boston | 20 | 18 | 18 | Jan. '20, | .50 |
| **LEAD** | | | | | | |
| Hecla | N. Y. Curb | 4⅛ | 4⅛ | 4⅛ | Dec. '19, | .15 |
| St. Joseph Lead | N. Y. | 16⅛ | 15⅛ | 15⅛ | Dec. '19, | .25 |
| Stewart | Boston Curb | *18 | *15 | †*16 | Dec. '15, | .05 |
| Utah Apex | Boston | 2⅛ | 2⅛ | 2⅛ | Nov. '18, | .25 |

*Cents per share. † Bid price on Feb. 28.

| Stock | Exch. | High | Low | Last | Last | Div. |
|---|---|---|---|---|---|---|
| **ZINC** | | | | | | |
| Am. Z. L. & S | N. Y. | 18⅛ | 16⅛ | 17⅛ | May '17, | 1 00 |
| Am. Z. L. & S. pf | N. Y. | 53 | 50 | 50 | Feb. '20, | 1.50 |
| Butte C. & Z | N. Y. | 10 | 8⅛ | 9 | Jul. '18, | .50 |
| Butte & N. Y | N. Y. Curb | ⅛ | ⅛ | ⅛ | | |
| Butte & Superior | N. Y. | 25⅛ | 22⅛ | 24 | Sept. '17, | 1.25 |
| Natl. Z. & L | Boston Curb | *10 | *6 | †*6 | May '17, | .02 |
| Success | N. Y. Curb | *7 | *5½ | *7 | July '16, | .03 |
| **GOLD** | | | | | | |
| Alaska Gold | N. Y. | 2 | 1⅞ | 2 | | |
| Alaska Juneau | N. Y. | 2 | 1⅛ | 1⅛ | | |
| Booth | N. Y. Curb | *6 | *5 | *6 | | |
| Carson Hill | N. Y. Curb | 25 | 21 | 23 | | |
| Cresson Gold | N. Y. Curb | 2 | 1⅞ | 2 | Dec. '19, | .10 |
| Dome Ex | Toronto | 30 | 28 | †28 | | |
| Dome Lake | Toronto | | | 13 | | |
| Dome Mines | N. Y. | 12 | 11⅞ | 12 | Jan. '20, | .25 |
| Goldfield Con | N. Y. Curb | *13 | *12 | *13 | Dec. '19, | .05 |
| Hedley | Boston | | | 4½ | June '19, | .10 |
| Hollinger | Toronto | 6.85 | 6.70 | †6.70 | Feb. '20, | .05 |
| Homestake | N. Y. | | | 61 | Sept. '19, | .50 |
| Kewanas | N. Y. Curb | *4 | *3½ | *4 | | |
| Kirkland Lake | Toronto | *72½ | *72 | *72 | | |
| McIntyre Porcupine | Toronto | 2 08 | 2.05 | †2.05 | Jan. '20 | .05 |
| Silver Pick | N. Y. Curb | *23 | *15 | *19½ | | |
| Teck-Hughes | Toronto | | | 18 | | |
| United Eastern | N. Y. Curb | 4 | 3⅛ | 3⅞ | Jan. '20, | .21 |
| West Dome | Toronto | 8½ | | 8 | | |
| White Caps | N. Y. Curb | 13 | 11 | 12 | | |
| Yukon Gold | Boston Curb | 1⅞ | 1½ | †1⅝ | June '18, | .02½ |
| **SILVER** | | | | | | |
| Adanac | Toronto | 4 | 3½ | †3⅜ | | |
| Bailey | Toronto | 6 | 5¼ | †5½ | Apr. '16, | .05 |
| Beaver Con | Toronto | 65 | 62½ | †62½ | | |
| Coniagas | Toronto | | | 3.00 | Nov. '19, | .12½ |
| Crown Reserve | Toronto | 39 | 36 | †36 | Jan. '17, | .05 |
| Hargraves | Toronto | 4 | 3½ | †3½ | | |
| Kerr Lake | Boston | 4⅛ | 4 | 4 | Sept. '19, | 1.00 |
| La Rose | N. Y. Curb | ⅜ | ⅜ | 7/16 | Apr. '18, | .02 |
| McKinley-Dar | N. Y. Curb | 64 | 60 | 62 | Jan. '20, | .03 |
| Nipissing | N. Y. Curb | 11 | 10⅛ | 10⅛ | Jan. '20, | .50 |
| Ontario Silver | N. Y. | | | 8 | Jan. '19, | .50 |
| Ophir Silver | N. Y. Curb | 1⅛ | 1⅛ | 1⅛ | | |
| Peterson Lake | Toronto | 21⅜ | 20⅜ | †20⅝ | Jan. '17, | .01½ |
| Sil. King Ariz | N. Y. Curb | ⅜ | ⅜ | ⅜ | | |
| Temiskaming | Toronto | 43½ | 42 | †43 | Jan. '20, | .04 |
| Trethewey | Toronto | 47 | 44 | †46 | Jan. '19, | .05 |
| **GOLD AND SILVER** | | | | | | |
| Atlanta | N. Y. Curb | *2⅛ | *2 | *2⅛ | | |
| Batopilas | Boston | | | 1⅜ | | |
| Bost. & Mont | N. Y. Curb | *69 | *64 | *65 | | |
| Cashboy | N. Y. Curb | *8⅛ | *7½ | *8 | | |
| El Salvador | N. Y. Curb | 3¼ | 2⅜ | 2⅞ | | |
| Goldfield Merger | N. Y. Curb | *4 | *3¼ | *4 | | |
| Jim Butler | N. Y. Curb | *25 | *24 | *25 | Aug. '18, | .07 |
| Jumbo Extension | N. Y. Curb | *7 | *6 | *7 | June '16, | .05 |
| Louisiana Con | N. Y. Curb | ⅛ | 1/16 | 1/16 | | |
| McNamara Cr | N. Y. Curb | *⅛ | *⅛ | *⅛ | | |
| Nev. Packard | Boston Curb | *25 | | | Apr. '19, | .02 |
| Rochester Mines | N. Y. Curb | | | *18 | Oct. '18, | .02 |
| Tonopah-Belmont | N. Y. Curb | 3 | 2⅞ | 2⅞ | Jan. '20, | .05 |
| Tonopah-Divide | N. Y. Curb | 2⅜ | 2⅜ | 2⅜ | | |
| Tonopah Ex | N. Y. Curb | 2⅜ | 2¼ | 2¼ | Jan. '20, | .05 |
| Tonopah Mining | N. Y. Curb | 2⅜ | 2¼ | 2⅜ | Oct. '19, | .15 |
| West End Con | N. Y. Curb | 2 | 1 15/16 | 1 15/16 | Dec. '19, | .05 |
| **SILVER-LEAD** | | | | | | |
| Caledonia | N. Y. Curb | *36 | *33 | *33 | Jan. '20, | .01 |
| Fed. M. & S | N. Y | | | 13½ | Jan. '09, | 1.50 |
| Fed. M. & S. pf | N. Y | 30½ | 28½ | 29½ | Dec. '19, | .50 |
| Iron Blossom | N. Y. Curb | 1/16 | ⅛ | 1/16 | Jan. '20, | .02½ |
| Marsh Mines | N. Y. Curb | *21 | *18 | *19 | | |
| Rex Con | N. Y. Curb | *8 | 8 | *8 | | |
| Simon S. L | N. Y. Curb | | | *1⅛ | | |
| Stand. S. L | N. Y. Curb | 1/16 | 1/16 | 1/16 | Oct. '17, | .05 |
| Wilbert | N. Y. Curb | 7 | 5⅛ | 7 | Nov. '17, | .10 |
| **NICKEL-COPPER** | | | | | | |
| Internat'l Nickel | N. Y | 21⅛ | 19⅜ | 20⅛ | Mar. '19, | .50 |
| Internat'l Nick. pf | N. Y | 88 | 88 | 88 | Feb. '20, | 1.50 |
| **QUICKSILVER** | | | | | | |
| New Idria | Boston | 6⅛ | 5⅛ | 6⅛ | Jan. '19, | .25 |
| **TUNGSTEN** | | | | | | |
| Mojave Tungsten | Boston Curb | *15 | *8 | †*8 | | |
| **VANADIUM** | | | | | | |
| Vanadium Corpn | N. Y | 47⅛ | 44⅛ | 47 | | |
| **GOLD AND PLATINUM** | | | | | | |
| So. Am. G. & P. | N. Y. Curb | | | 8⅛ | | |
| **MINING, SMELTING AND REFINING** | | | | | | |
| A. S. & R | N. Y | 63 | 59⅛ | 60 | Dec. '19, | 1.00 |
| A. S. & R., pf | N. Y | 95¼ | 94½ | 94½ | Dec. '19, | 1.75 |
| Am. Sm. pf., A | N. Y | 81½ | 81½ | 81½ | Jan. '20, | 1.50 |
| Natl. Lead | N. Y | 78⅛ | 72⅜ | 76⅛ | Dec. '19, | 1.25½ |
| Natl. Lead, pf | N. Y | 104⅛ | 104⅛ | 104⅛ | Dec. '19, | 1.75 |
| U. S. Sm. R. & M. | N. Y | 65 | 63 | 64 | Jan. '20, | 1.50 |
| U. S. Sm. R. & M., pf | N. Y | 45⅞ | 45½ | 45½ | Jan. '20, | .87½ |